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Montana Natural Resource Information System

Fiscal Year 1992 Annual Report

September 1992



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INTRODUCTION

The Montana Natural Resource Information System (NRIS) was formed in response to the growing need for quick access to the increasing amounts of natural resource information. NRIS was designed to be a comprehensive program for the acquisition, storage, and retrieval of existing data relating to the natural resources of Montana. In 1985, NRIS began by providing services through its Montana Natural Resource Index and the Montana Natural Heritage Program. In response to growing user needs, the program has expanded to include the Montana Water Information System and the NRIS Geographic Information System. NRIS now offers a wide variety of data management, information indexing, and data retrieval services.

Over the years, NRIS has developed services to meet the growing information needs and challenges of Montana's governmental agencies, private business, and general public. Fiscal year 1992 was a busy year for NRIS--we had many goals and are proud of our accomplishments. NRIS received over 860 information requests. The Natural Heritage Program responded to over 440 information requests and published 28 reports including P. D. Skaar's *Montana Bird Distribution*, 4th edition; the Water Information System responded to 230 information requests and began the successful implementation of the Drought Monitoring System; and, the Geographic Information System responded to over 210 service requests while re-tooling with new hardware and software that greatly increased system capabilities.

This annual report contains specific program activities for the overall NRIS program, the Natural Heritage Program, the Water Information System, and the Geographic Information System. Each program report describes the major goals for FY 1992, details the many accomplishments, and outlines goals for FY 1993. The appendices contain supporting information, examples of some of the information requests filled during the year, example maps, and listings of new information resources.

PROGRAM REPORTS

NATURAL RESOURCE INFORMATION SYSTEM

NRIS

The Natural Resource Information System's most visible services are provided through its programs: the Natural Heritage Program, the Water Information System, and the Geographic Information System. However, its principle mission and many of its activities are conducted under the general umbrella of NRIS and the Natural Resource Index. This section of the report describes some of the overall NRIS goals and accomplishments.

1992 GOALS

Manage a timely, cost-effective clearinghouse and referral service to link users with the best sources of information

The principle goal of NRIS is to be "a comprehensive program for the acquisition, storage, and retrieval of existing data relating to the natural resources of Montana" (90-15-301(1), MCA). NRIS carries out this mandate through all of its programs and through the Montana Natural Resource Index. NRIS continues to maintain, refine and index existing documents and other natural resource data sources, including both published and unpublished sources.

Participate in the design and development of uniform, easily accessible, statewide databases for each of Montana's natural resources.

NRIS serves as a liaison to and coordinates among agencies that collect, manage, or use the same types of natural resource information to prevent the duplication of effort and to promote information sharing. In addition, NRIS continues to provide technical assistance to agencies to better manage natural resource information. NRIS is committed to continue to provide coordination and technical assistance.

Maintain, refine, and continue to operate the Montana Natural Heritage Program.

NRIS is required to operate the Montana Natural Heritage Program (90-15-302(1), MCA). The Heritage Program is "a program of information, acquisition, storage, and retrieval for data relating to the flora, fauna, and biological community types of Montana." (90-15-101(3), MCA). NRIS is committed to the continued operation and success of the Heritage Program.

Maintain, refine, and continue to operate the Montana Water Information System.

NRIS developed its Water Information System (WIS) based on the needs expressed in a user assessment conducted in 1985. The WIS is a data clearinghouse and referral service linking patrons with the best sources of information. The system supplies information on surface water, ground-water, water quality, snow pack and water rights. NRIS is committed to operating and ensuring the success of the Water Information System in meeting patron needs.

Maintain, refine, and continue to operate the Montana Geographic Information System.

The NRIS Geographic Information System (GIS) was created in 1987 to provide GIS support to the Upper Clark Fork Superfund sites. The system has developed into an integrated database about Montana's geographic features along with powerful analytical and cartographic capabilities. GIS services are now provided to a wide range of public sector, private sector, and general public

users. NRIS is committed to the continued successful operation and improvement of the Geographic Information System.

Continue to improve NRIS services and access to information.

Information resources and needs are increasing rapidly and NRIS will explore and develop better services for its patrons.

1992 ACCOMPLISHMENTS

Most of the program's accomplishments are tied directly to the three programs: the Natural Heritage Program, the Water Information System, and the Geographic Information System. However, there are some accomplishments that encompass all of the programs. Some of these are described below.

Conversion to WLN

In 1992, NRIS began migration from the in-house Montana Natural Resource Index (MNRI) to the more powerful and more accessible WLN library network. WLN is a regional bibliographic index available either on-line or via stand-alone PC workstations (*LaserCat*) using CD ROM technology. Over 50 Montana libraries have *LaserCat* stations (see map on next page). These libraries provide ready access, nearly anywhere in the state, to natural resource information for state agency personnel, the private sector, and the general public. Not only is information access in Montana improved, but WLN is found throughout the Pacific Northwest. The network allows patrons in the Northwest to query Montana library holdings and for Montana patrons to query library holdings throughout the region.

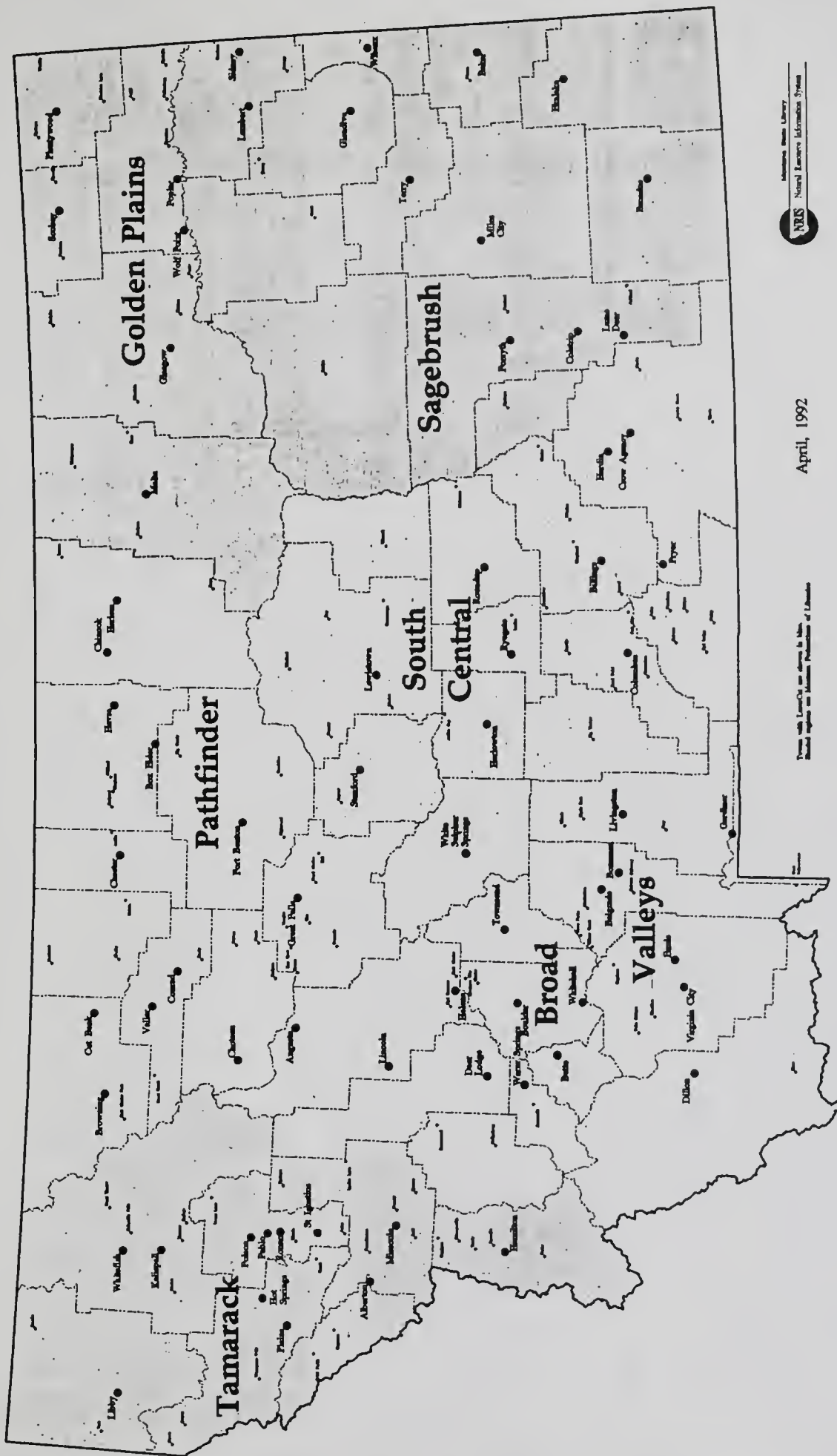
The NRIS Administrative Assistant (Pam Smith) has begun work to learn the WLN system. She has made good progress in cataloging back-logged documents and in particular, she is entering citation information for publications and reports of the Natural Heritage Program. Copies of these publications will be made by NRIS and placed on the shelf in the State Library. NRIS has identified the methods needed to convert the bulk of its MNRI listings to WLN and will begin that process in FY 1993.

During FY 1992, NRIS and the Department of Fish, Wildlife and Parks signed an interagency memorandum of understanding to use WLN. The basic commitments of the agreement are that:

- (1) NRIS and FWP agree to cooperate in building a data base, indexed by subject and geographic area, and useful to both parties, of sources of information on Montana's natural resources;
- (2) FWP agrees to adopt the WLN system, following the guidelines and protocol subject to the specific needs of FWP;
- (3) NRIS agrees to provide necessary support for the development of the data base, including, as necessary, software support, printed guidelines for data entry and retrieval, assistance in entering records into the data base, assistance in cataloging documents according to entry codes, assistance in constructing queries of the data base, and training of designated FWP staff on managing and using the data base internally (within the FWP).

NRIS is encouraging state agencies to join in similar efforts to place state agency publications on WLN. We expect other agencies to commit to the WLN conversion process during FY 1993.

Montana Towns With LaserCats



Access to Geographic Information

NRIS instituted a new project in 1992 called *ArcView™ in Libraries: Public Access to Public Data*--an innovative program that is fast becoming a model in the nation. NRIS has placed a Unix graphics workstation in the reference section of the State Library to provide on-line access to NRIS's geographic data. Individuals may work with reference librarians or use the system themselves to query a variety of geographic databases. Tabular reports and color maps may be printed using the graphic, easy-to-use, map display interface: ArcView™. The program will expand in the coming year to bring ten Montana libraries (public, research, school, special) on-line with their own PCs or workstations providing access to community, statewide, national, and worldwide geographic data.

The library's computer workstation provides direct access to several NRIS geographic information databases including a USA database, general Montana statewide information, the Montana Drought Monitoring System monthly reports, U.S. Geological Survey map information, and community databases. A one-day, in-house training session for library staff was held July 7. In addition, NRIS staff has prepared draft user documentation for the system and is examining other data sources for access by the system. There are plans to add a world-wide database, Montana census information, and additional Montana community data.

The State Library is also part of a national project with the Association of Research Libraries. In that project, 90 research libraries across the country are installing ArcView™ on PCs to provide access to 1990 census data and maps.

Increased Presence in Montana Libraries

Throughout 1992, the NRIS program continued to explore means of integrating more fully into the State Library. Specifically, the GIS, the WIS, and the Heritage coordinators joined the library's Administrative Council: the State Library's management group. This direct involvement for NRIS staff opens new opportunities for resource sharing and more effective management of the program. In addition, cross-training of the library's Information Resource (IR) staff and NRIS staff continued. A closer working relationship developed which produced more effective and efficient methods for filling patron requests.

The NRIS staff has worked more closely with Montana's Libraries to build better ties. Public, school, and research libraries across the state offer a front line of contact for natural resource information and NRIS services. Several of the NRIS staff attended the Montana Library Association meeting in Bozeman in April. Jim Stimson and Allan Cox presented a workshop describing NRIS services, and Kris Larson and Allan Cox presented a workshop on the *ArcView™ in Libraries* project. In addition, NRIS participated in the Montana State Library exhibit and had a graphics workstation with ArcView™ and NRIS GIS data running at the display.

Service Evaluation

In a continuing effort to improve service and assess program effectiveness, NRIS recently initiated a service evaluation survey. A cover letter and survey form is delivered to each patron when their information or service request is filled (see Appendix A). The initial returns indicate that NRIS is fulfilling a valuable service in a timely fashion. The survey will continue as a permanent part of filling information requests to provide an ongoing method of program evaluation.

Other

The growth of NRIS programs, coupled with the GIS system re-tooling this fall, mandated the physical remodeling and office re-arrangement of the NRIS area in the State Library. The Library Development program in the State Library volunteered some of their space for NRIS expansion. A major office reorganization occurred in late November 1991. The result is a significant increase in space efficiency and working atmosphere.

Fiscal year 1992 was a time for overall improvement in computer capabilities. New laser printers were added for report printing. New and more powerful PCs were acquired for the Water Information System under contract with the U.S. Geological Survey. The Heritage Program acquired PCs for all of its staff and improved hardware and software for database management and report creation.

The NRIS GIS program migrated from a mini-computer base to a local area network of eight UNIX graphics workstations, a color electrostatic plotter, three CD ROM readers, a ¼" tape drive, an 8mm tape drive, a 9-track tape drive, and a digitizer. The GIS software and UNIX operating system were upgraded to new and more powerful releases.

NRIS added new staff to the Natural Heritage Program in 1992 and there were several other personnel changes in the program. Jon Sesso, NRIS Director, left the program in September 1991 to become the Planning Director for Butte-Silver Bow. Allan Cox, the NRIS GIS Coordinator became the new NRIS Director in February 1992. Other staff changes are discussed in the individual program reports. On the following page is the current organizational chart for NRIS.

1993 GOALS

NRIS plans to increase its integration of services into the State Library and the Montana library community. Public, special, school, and research libraries can act as the initial contact for fielding requests for information or for NRIS services. In addition, the library system makes a ready made distribution network for natural resource information. NRIS plans on plugging into this network to increase its effectiveness in serving Montana's citizens.

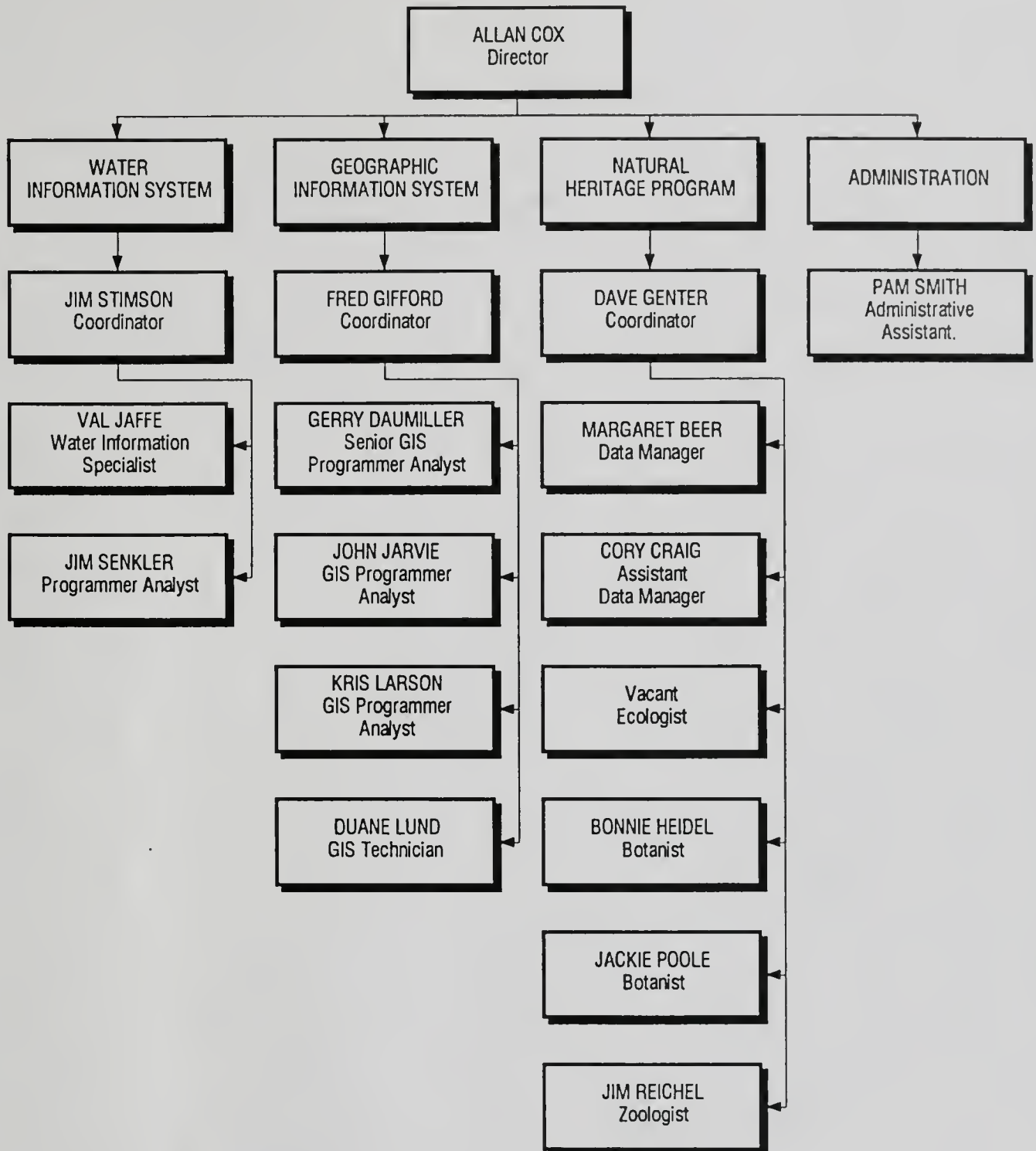
NRIS will continue to convert its Montana Natural Resource Index to WLN. WLN is a regional bibliographic index available either on-line or via stand-alone PC workstations (*LaserCat*) using CD ROM technology. WLN will provide a wider availability of access to NRIS data. People in over 50 Montana communities can query the system at their local libraries.

NRIS will continue to support and improve the information delivery services of its Natural Resource Index, Natural Heritage Program, Water Information System, and Geographic Information System.

NRIS plans to continue to identify and implement methods to increase access to natural resource information. These methods will include more hands-on systems for the public and more on-line access to NRIS information.

NRIS plans to continue to expand the installed base of libraries using the ArcView™ GIS interface program. This expansion will involve developing the support necessary to maintain the databases and provide training to the users.

Montana Natural Resource Information System





NATURAL HERITAGE PROGRAM

NHP

The Heritage Program was engaged in a number of significant inventory and research projects during FY 1992. These involved coordination and cooperative efforts with most major federal and state land management agencies, several Tribes, private industry and individuals, and several non-profit groups.

Significant advances were made in data management and services for government and private sector users, and two remote installations of the Biodiversity and Conservation Data System (BCD) have been set up in Missoula.

1992 GOALS

Provide ready access to site-specific data on Montana's biological diversity.

This goal continues to be our top priority for service. Requests continue to increase--an average of 37 per month. While most requests involve site-specific or species-specific queries, increasingly we deal with information at the community and landscape level for assessments.

Maintain checklists of Montana vertebrates and high ranked plant species.

Lists were updated and distributed for animals, rare plants, and plant communities. There have been a number of changes in the federal status and biological rankings for animal species. Several additions and status changes were made to the U.S. Fish & Wildlife Service's list of candidate species. Revisions to the Forest Service's sensitive species list were incorporated.

Prepare and maintain a computerized abstract on each vertebrate species in Montana.

Additions and updates were completed on several species and groups, including distribution and habitat use of bats. The Heritage Program worked with the U.S. Forest Service to develop a bibliography and status report on lynx and wolverine in North America and a review of sculpin (Genus: Cottus) literature for Montana and the region.

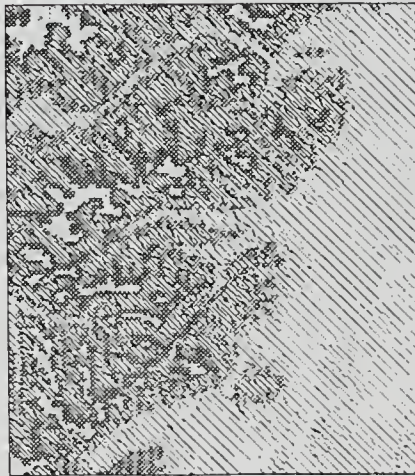
Prepare and maintain an updated list of available literature or secondary sources of information.

The Source Abstract database increased to 4325 records, including abstracted and subject-referenced information on reports, publications, field surveys, maps, and knowledgeable individuals. We anticipate making a large part of this database available to John Weigand and Dick Mackey in Bozeman as part of their efforts on the EIS for wildlife management practices in Montana.

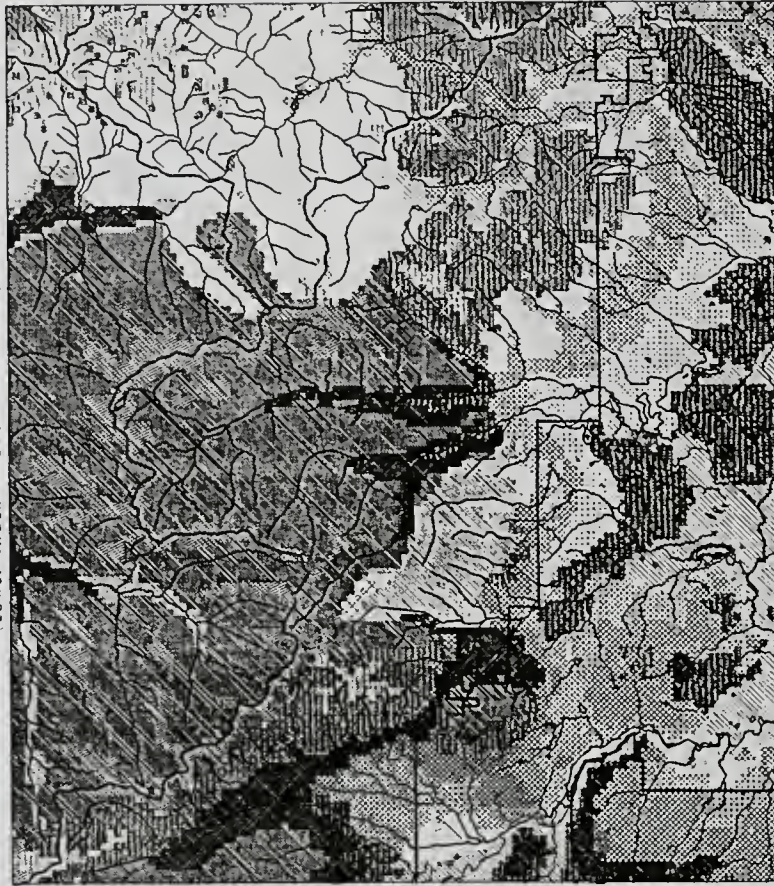
Assist agencies in developing and conducting GIS projects on fish and wildlife.

Most of this effort has been through training and technical consultation with NRIS-GIS. The Heritage Program has provided appropriate information and recommendations on use of biological data in a GIS environment. In addition, there have been several significant land use coverages digitized and maintained at NRIS. Technical assistance from NHP continues to support the U.S. Fish and Wildlife Service Gap Analysis project. In addition, the Heritage Program conducted an assessment of biodiversity in the Blackfoot-Clearwater area (see map on following page).

Elevation, Feet



Bio-Environmental Limit Index
(Lower Index = Fewer Limitations)



Soils



Aspect



Slope, Percent



1992 ACCOMPLISHMENTS

Data Responses

Over 440 data requests were handled in FY 1992, with about one-third of these requests coming from state agencies. This compares with 353 requests in FY 1991, an increase of about 25%. Products provided included: bibliographies, printouts of sensitive species location records, GIS maps showing sensitive species distribution (see map in Appendix C), vertebrate species lists for specific areas, copies of technical reports prepared by Heritage staff, and miscellaneous lists, reprints and technical support.

Montana Interagency Natural Areas Committee

The Heritage Program continues to provide technical service and data management for coordinated statewide natural areas activities. NHP staff participated in ongoing meetings and projects, most recently to plan the 1992 fall conference. Heritage Program databases have been modified and expanded to manage interagency natural areas data. As data become centralized, procedures such as natural areas nomination, tracking targeted communities and species, and ranking and evaluating natural areas are now becoming standardized statewide.

Staff Changes

Bonnie Heidel and Jackie Poole were hired to fill vacancies as botanists. Both Bonnie and Jackie have over ten years experience with rare plant botany with other state heritage programs. In response to an increasing project workload with wildlife, Jim Reichel was hired as staff zoologist. Cory Craig was hired this summer as a data management assistant. She will allow us to keep up with the increasing workload of requests and still be able to enter new information, develop new databases, and enhance service.

Participation on Species Recovery Groups

Dave Genter and Jim Reichel have actively participated in several species recovery committees and work groups. These include the Arctic grayling, bull trout, bald eagle, peregrine falcon, and piping plover. Several new interagency groups were formed to coordinate research efforts and information management on rare bats (3 species), ferruginous hawk, rare forest owls (three species), and neotropical migratory birds. Additionally, Genter represented Montana at the first meeting of the international harlequin duck working group in Moscow, Idaho.

ZOOLOGY: Research, Monitoring, and Inventory on Rare Animals

Projects include survey results and status reports on the following:

- Distribution and habitat use of sculpins (Genus: Cottus) in northwest Montana
- Status report on bat surveys in the Pryor Mountains, southcentral Montana
- Status report on bat surveys on the Deerlodge National Forest (in prep)
- Report on boreal owl and flammulated owl surveys on the Gallatin National Forest
- Harlequin duck survey results in the Flathead River Basin
- Harlequin duck survey results along the Rocky Mountain Front (in cooperation with the Lewis and Clark National Forest)
- Species conservation guide for the Coeur d'Alene salamander, draft copy (prepared in cooperation with the Idaho Fish and Game Dept. and Kootenai National Forest)

- Cave surveys and mapping in the Pryor Mountains of southcentral Montana
- Annotated bibliography for sculpins (Genus: Cottus) (in prep)
- Report on banding activities and colonial bird monitoring in Montana (submitted to USFWS and MDFWP).

Special projects include production of P.D. Skaar's *Montana Bird Distribution*, 4th ed. Funds were raised to compile, synthesize data and maps to have 1,500 copies printed and distributed. This publication is a cooperative project with the Montana Department of Fish, Wildlife, and Parks' Nongame Program and the Audubon Society. In conjunction with this project, a bird distribution database was established, allowing us to record and track all bird species statewide by quarter latilong. A revised checklist of *Montana Birds* was produced and sent to the FWP printshop for printing and distribution.

BOTANY: Research, Monitoring and Inventory on Rare Plants

Projects include surveys and status reports on the following taxa:

- Allotropa virgata - status review on Bitterroot and Deerlodge National Forests
- Aquilegia brevistyla - status review on the Lewis and Clark National Forest
- Arabis fecunda - exclosure study, southwest Montana
- Botrychium minganense - status report on Lolo National Forest
- Claytonia lanceolata var flava - report on surveys in southcentral Montana
- Eriogonum x lagopus - conservation status in southern Carbon County
- Goodyera repens - status review update on Lewis and Clark National Forest
- Howellia aquatilis - update to status review: field surveys, monitoring, and transplants
- Penstemon lemhiensis - demographic monitoring, report to BLM

A botanical survey of Goat Flat, a proposed Research Natural Area on Deerlodge National Forest, was conducted.

COMMUNITY ECOLOGY

NHP initiated four *Challenge-Cost-Share Projects* with the U.S. Bureau of Land Management to be completed in the spring of 1993. These projects include:

1. development of comprehensive lists and rarity ranks of vegetation types on BLM lands in Montana;
2. development of a vegetation type classification for selected BLM lands in Beaverhead, Granite, Silver Bow, and Madison counties;
3. development of a vegetation type classification for selected BLM lands in the Pryor Mountains;and,
4. development of a vegetation type classification for all BLM lands in east central Montana.

The Natural Heritage Program community ecologist also:

- Completed a report describing uncommon vegetation types of southwestern Montana.
- Developed an initial draft of a field guide to the forest and woodland vegetation types of Montana.
- Published papers in the *Northwest Environmental Journal* and the *Proceedings of the Scientific Conference on the Greater Yellowstone Ecosystem*. These papers concerned the vegetation of the Pryor Mountains and an application of a GIS and environmental modeling in nature preserve evaluation.
- Published a paper on forest condition indicators for monitoring in the journal *Environmental Monitoring and Assessment*.
- Published a chapter on the response of vegetation diversity to climate in the book *Landscape Boundaries*.
- Continued development of a major paper (to be submitted in 1993) on new quantitative approaches in nature preserve selection and design.
- Conducted biodiversity surveys on private land sites at Helena Regional Airport and along the Clark Fork River near Drummond.
- Continued refining the NHP's comprehensive list of vegetation types for the state (ca. 350 types) and their individual rarity ranks.
- Began initial development of a interagency (U.S. Forest Service, BLM, Department of State Lands, NHP, etc.) plant community database.
- Hired two excellent field assistants to help collect data at over 200 intensive sample plots.
- Began testing computer software for the analysis of spatial pattern in vegetation cover along transects for correlation with management practices.

1993 GOALS

We anticipate that the number of information requests will continue to increase. Our biggest challenge will be to maintain the quality and timely service that users have come to expect, and to develop new methods of retrieving and displaying increasingly complex information. This may include expanding the number of off-site installations of Heritage databases, and assuming the technical support for these installations. It will also require developing and managing new linkages to GIS and other emerging technologies, as well as continuing to augment the core Heritage databases.

Greater awareness and access to information and databases managed by NHP will be a priority for the coming year. We will target two primary user groups: government agencies and private consultants.

With the addition of a staff zoologist, we anticipate increased project activity and consultation on rare animals. This addition will be particularly helpful to agencies that require specific information or expertise in assessing development impacts and preparing recovery plans.

Integration of various data into a site-based records has long been a goal. We will pursue this through efforts with the Interagency Natural Areas Committee and continuing our conservation planning meetings with state and federal agencies.

WATER INFORMATION SYSTEM

WIS

The Water Information System continues to be the central access point for data from a wide variety of dispersed sources. The number of data sources accessed was expanded during Fiscal Year 1992 in a continuing effort to improve the ability to deliver large amounts of information that are immediately usable by patrons. Significant progress was also made in utilizing GIS technology to support Water Information activities and the State's new Drought Monitoring System. GIS software and map products produced under this effort serve a wide range of data interests and will be made available to other agencies that can benefit from them. In addition to the data clearinghouse activities, Water Information staff provide regular updates and input to several key legislative and agency-level advisory committees that establish statewide water policy. Through all of its activities, the Water Information System is fulfilling the original mandate to make all types of water information more readily accessible and improve data management activities on a statewide basis. Specific Water Information System 1992 goals, accomplishments, and 1993 goals are presented below.

1992 GOALS

Maintain and refine the Water Information clearinghouse services.

Since the inception of the Water Information System, the primary goal has been to identify the most appropriate sources of information and provide efficient and timely access to any person requesting information. A second related goal is to provide the information to the user in a ready-to-use format. Both goals are addressed on a daily basis with every data request. Efforts to find new data sources and provide access are on-going.

Support statewide efforts to share data and coordinate data collection activities.

The establishment of the Water Information System created a central contact point in Montana for the exchange of water resource data and related information. Water Information staff are routinely contacted by state, federal, and private organizations as a first step in planning new efforts and to determine the best way to distribute information generated by a planned project.

Participate in the design and development of uniform, easy to use software that makes data on Montana's natural resources more readily accessible and usable.

Many times important water resources information exists but in a format that is difficult to use, or there is no automated way to access and use it. NRIS is often contacted for assistance in instances like this and responds by designing easy-to-use computer software that reformats the information and creates efficient and effective access. Several NRIS software user interfaces are being distributed by state agencies.

Increase use of Geographic Information System (GIS) technology in the Water Information clearinghouse operations.

The Water Information System is committed to using new technology to improve operations and to better assess the distribution of water data statewide. Efforts are focused on creating an easy-to-use interface to make the technology available to a wider range of state agency personnel who can benefit from GIS. GIS is also being used to support the statewide drought monitoring effort.

Manage and support the Fish, Wildlife and Parks (FWP) Montana Rivers Information System (MRIS).

MRIS is the only data base that provides information on fisheries, wildlife, and recreation, natural and geologic features, and cultural features for more than 3,500 stream reaches in Montana. MRIS is accessed with software designed and produced by NRIS, and has been widely distributed throughout the state.

Coordinate work to design and initiate operation of a statewide Drought Monitoring System.

A new program for monitoring and mapping moisture conditions statewide is being implemented to facilitate ways to respond more effectively to the effects of drought. NRIS will coordinate this cooperative effort and provide GIS technical support for the project. The project is funded for FY 1992 and 1993 by a water development grant.

Brief and advise committees of the Montana Legislature and state agencies on water resource data issues.

Several legislative and agency-level committees establish statewide policy on important water resource issues. Staff of the Water Information regularly attend meetings and provide special briefings on NRIS, the Water Information component, and data management issues.

1992 ACCOMPLISHMENTS

Data Clearinghouse Activities

New on-line access was established with the Montana Office of the Soil Conservation Service (SCS) and the Montana Climate Center at Montana State University. These new links allow NRIS to obtain climate data not previously accessible through other data source.

New retrieval procedures have been established on the USGS computer system WATSTORE that allow retrieval of 'real time' data for about 40 surface water gaging stations at one time. Prior to establishing the new method data had to be retrieved one station at time.

NRIS is maintaining subscriptions to five EarthInfo, Inc. Compact Disks that provide climate and streamflow data for the U. S. and Canada. These products provide important supplemental access to USGS and National Weather Service data, and permit the download of large volumes of data quickly.

NRIS updated the software used to develop user interface and data base reporting programs. This new version facilitates creation of more sophisticated programs, increases software performance, and reduces development time.

Upgrades for two other commercial software products were also purchased. These programs are used extensively to reformat data to make it easier to use. Reformatting data retrieved from various sources is one of the primary activities under the clearinghouse service.

NRIS is working closely with the state and federal agencies which are primary sources of hydrologic and climatic data for Montana. Efforts focused on improving access and coordination in responding to information requests. There has been significant progress made in this area with the U. S. Geological Survey (USGS), U. S. Soil Conservation Service (SCS), Montana Bureau of Mines and Geology (MBMG), and the Montana Climate Center (MCC).

NRIS hired Val Jaffe in March 1992 to fill the NRIS Data Technician position. This is the lead position dealing with information requests. Ms. Jaffe brings a wide range of work experience in

the area of natural resources, specifically in water resources. Ms. Jaffe replaces Peter Langen who accepted a position with the Reserved Water Rights Compact Commission.

NRIS negotiated the purchase of a new 486 computer under the U. S. Geological Survey (USGS) NAWDEX contract. The computer supports contract work and functions as the primary computer serving the data clearinghouse activities. The new machine is a substantial upgrade from the previous computer serving in this capacity.

Montana Rivers Information System Management for Fish, Wildlife, and Parks

The Montana Rivers Information System (MRIS) remains one of the most intensively used data systems available through NRIS. One of the main goals for the MRIS project is to update the system with new data in Fiscal Year 93-94. To facilitate this update, NRIS provided programming services, through the MRIS contract, to the Department of Fish, Wildlife and Parks (FWP) to create an edit/entry system so biologists could enter new data. The edit/entry system is being used to update the FWP Fisheries data base which will in turn be used to update the MRIS. The recent completion of the edit/entry software represents a major step forward for the FWP Fisheries Division and for the MRIS project as a whole.

NRIS is assisting an effort to map and uniquely label stream segments throughout Montana. The work is supported primarily by the Bonneville Power Administration (BPA) as part of the MRIS project. NRIS support for the project consists of providing office space, access to GIS hardware, and technical assistance from several GIS programmers to FWP contract personnel. NRIS will also assist efforts to refine the general methodology for assigning stream reach numbers and making the resulting GIS layer spatially accurate.

Montana Drought Monitoring System

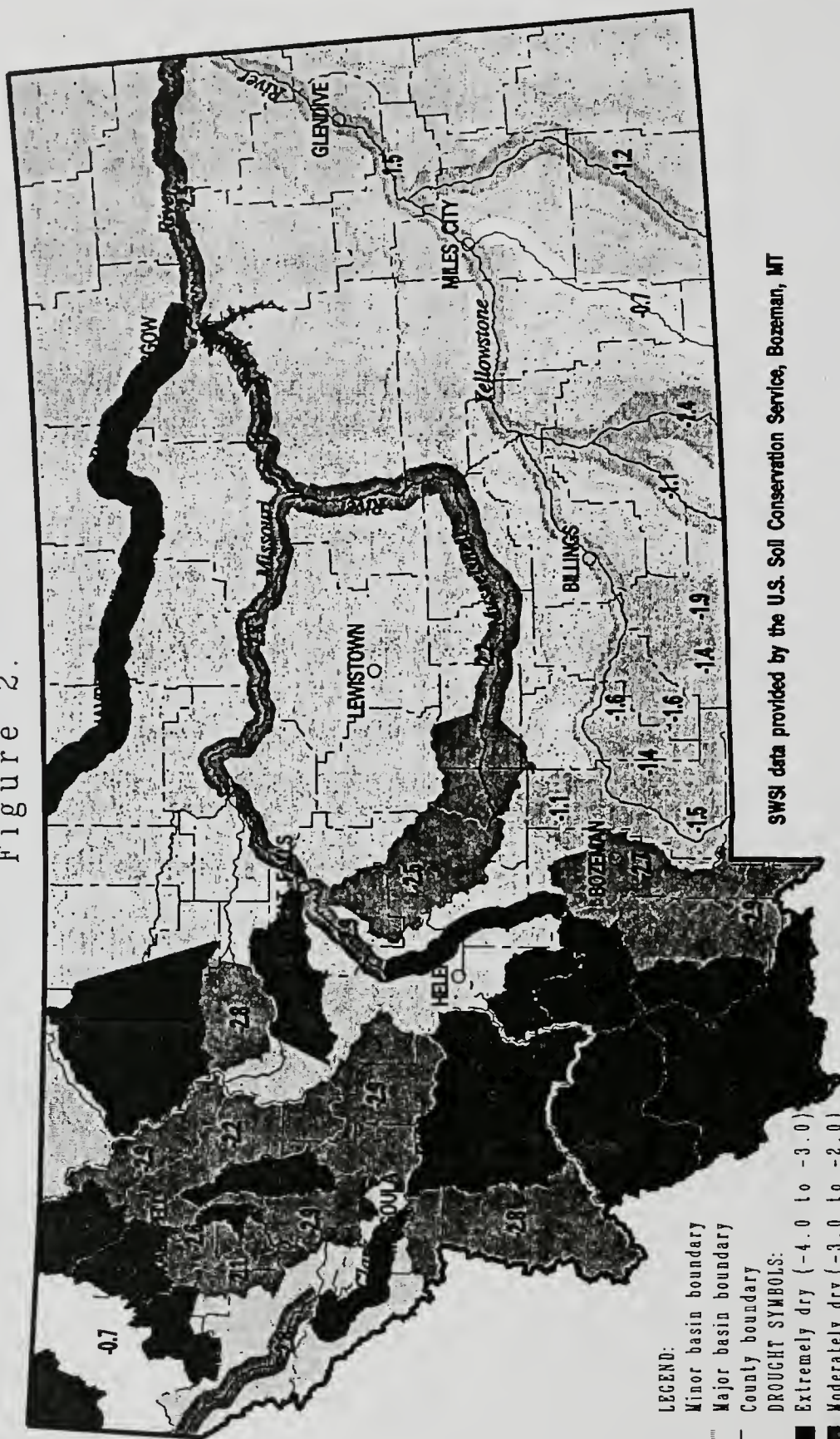
Recent years amply demonstrate Montanan's vulnerability to drought. Drought seriously impacts land, water, and biological resources, and directly affects all Montana citizens. The Drought Management Section of the DNRC State Water Plan recommends that the state pursue a proactive, preventive approach to easing drought impacts and suggests focusing on the local level. The idea is for the state to target its resources to help local people avoid or mitigate drought impacts before it is too late. To accomplish this, a more accurate method of monitoring moisture conditions and surface water supplies was necessary. The Governor's Drought Management Steering Committee, composed of representatives of many of the government agencies and private and public interest groups involved in or affected by drought, established a new statewide monitoring system. The Natural Resource Information System (NRIS), Department of Natural Resources and Conservation (DNRC), Montana Climate Center (MCC), and the U. S. Soil Conservation Service (USSCS) worked together to build the new system.

NRIS collects drought data from the MCC and the USSCS, imports the information into its Geographic Information System (GIS), and produces a series of drought monitoring maps that depict moisture conditions for dry land and irrigated agricultural lands, and a map displaying current and historic stream flows statewide (see maps on following pages). These maps are packaged with a monthly drought report from the Department of Natural Resources and Conservation and sent to over 250 Montana public agencies, ranchers and farmers, and county officials. In addition, special versions of the drought maps have been developed for local television stations. The maps are used on the news to aid reporting on the current moisture conditions around the state.

Statewide Coordination

The Water Information Coordinator provided briefings to several working groups and the Advisory Committee of the Montana State Water Plan. The Plan examined water quantity and quality issues for ground water and surface water in Montana. There were several plan components dealing with data management and dissemination. By having input to and coordinating with the Water Planning

Figure 2.

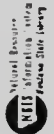
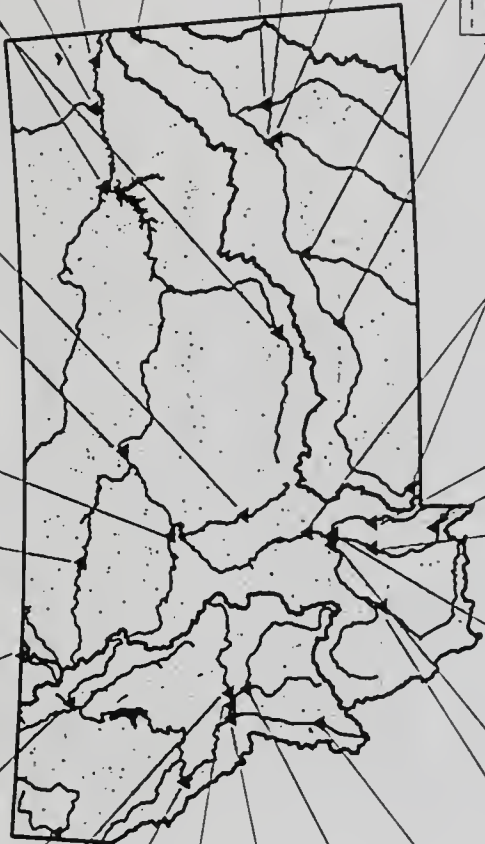


SWSI data provided by the U.S. Soil Conservation Service, Bozeman, MT

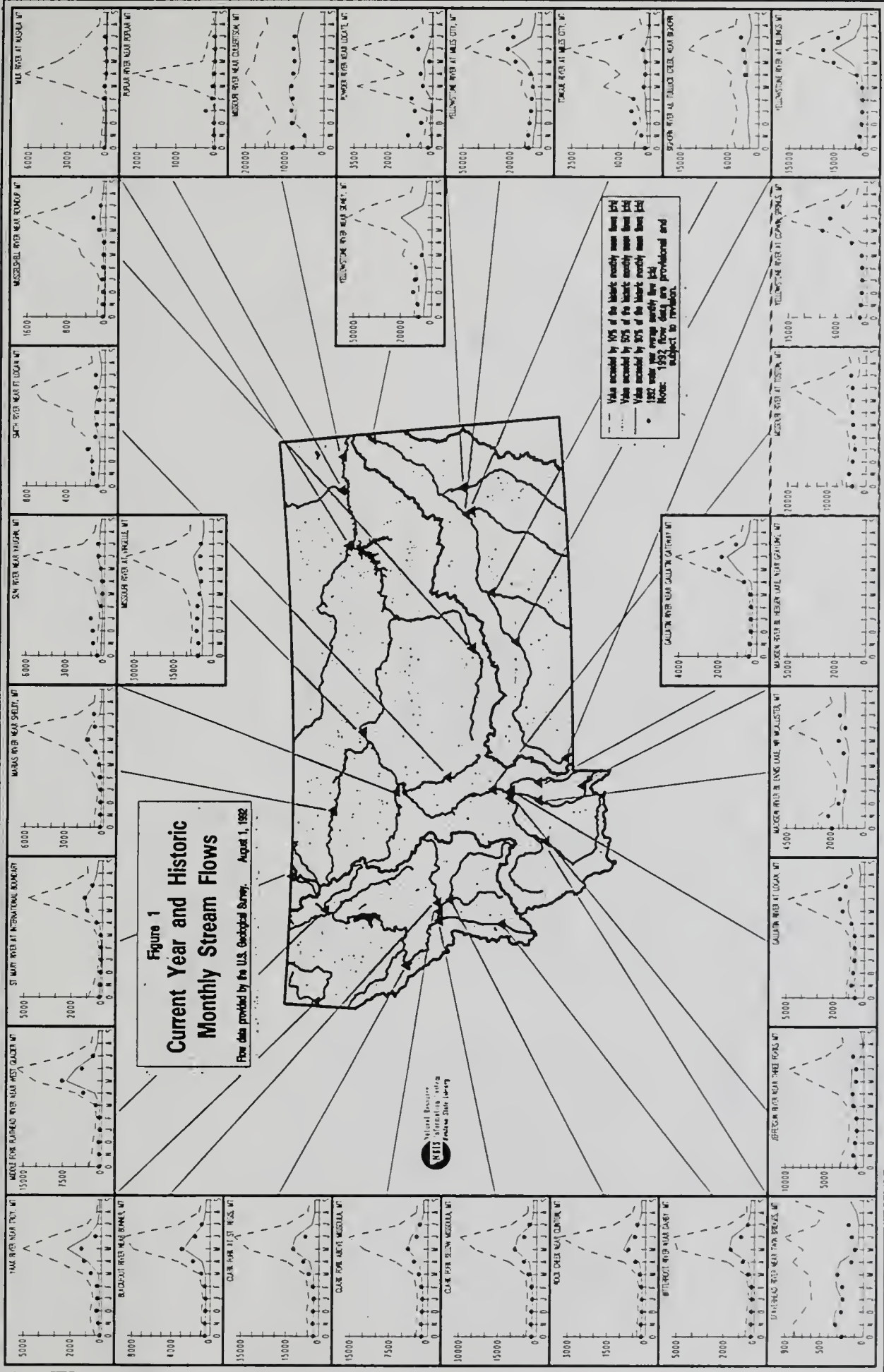
Surface Water Supply Index (SWSI) Values: June 1, 1992

NOTE: SWSI values are primarily an indicator of water supply conditions for irrigated lands within each basin.

Figure 1
Current Year and Historic
Monthly Stream Flows
 Flow data provided by the U.S. Geological Survey, August 1, 1982



--- Value recorded by 10% of the historic monthly mean flow (10%)
 - - - Value recorded by 50% of the historic monthly mean flow (50%)
 . . . Value recorded by 80% of the historic monthly mean flow (80%)
 . . . 1982 value for average monthly flow (1982)
 Note: 1982 flow data are provisional and subject to revision.



process, NRIS makes a direct contribution to the establishment of statewide policies on important water resource issues.

Special briefings were also given to the Legislative Water Policy Committee and the Environmental Quality Council concerning the Water Information System and the new Drought Monitoring System. Both committees have strongly supported and endorsed the NRIS program and its leadership role in Drought Monitoring, and have requested regular updates to track NRIS's progress.

Jim Stimson, the Water Information Coordinator, was elected as Chairman of the Montana Ground Water Assessment Steering Committee, established by Senate Bill 94. The Committee oversees two new programs to monitor and assess Montana's ground water resources over the next 20 years. The Bill gives the Steering Committee authority to act as the board of directors for the new programs. Specifically, the Committee must exercise oversight of project-level work plans and all budget expenditures, and take the lead to coordinate with other agencies conducting ground water investigations in Montana.

Software Design

At the request of the Helena Water Rights Field Office of the Department of Natural Resources and Conservation (DNRC), NRIS developed PC software to query and generate reports for ground water data from the MBMG Ground Water Information Center (GWIC). The product has been well received and is now being distributed by the MBMG GWIC with all large data sets.

Modification and refinements were made to the GIS interface known as the 'GDI.' This interface is a valuable tool for the Water Information System because it allows the staff to see the distribution of data collection sites maintained by several state and federal agencies. The GDI also makes it possible to identify sites that are most pertinent to address the information request at hand.

Work on the USGS PC Master Water Data Index (PC MWDI), or NAWDEX, project is in the final stages with the software scheduled for delivery in October 1992. A very significant improvement in the PC MWDI was recently achieved by restructuring the way the system stores data. The modification reduces the data storage requirements by as much as 80 percent. This will make it much easier for the USGS to distribute the PC MWDI nationwide to patrons using computers with limited disk space.

At the request of DHES Water Quality Bureau (WQB), NRIS applied for a grant to develop a ground water atlas for Montana. Under the proposed project, NRIS will receive ground water and geologic GIS layers and data, from the MBMG, and acquire other data to create additional GIS map layers. The published atlas will consist of a series of maps displaying various ground water features, general descriptions and highlights of each map, tabular data and summary statistics, and schematic block diagrams showing the general types of ground water regions present in Montana.

1993 GOALS

Continue to operate and refine the Water Information System and the data clearinghouse services.

Continue to promote and support statewide efforts to share data and coordinate data collection activities.

Refine data base software products developed at NRIS and design new products for other types of natural resources data.

Improve the GDI GIS user interface and other GIS software to serve a wider range of users who can benefit from the GIS technology.

Complete the update of the Montana Rivers Information System (MRIS) and refine the System's user interface. In addition, NRIS will complete the first phase of work to create a GIS river reach layer and improve the layer's spatial accuracy.

The Drought Monitoring System was developed in 1992 under a grant from the Water Development Grant program. In the next biennium, NRIS will incorporate the program into its overall program of information management and dissemination. NRIS will provide monthly drought monitoring maps during the second season of operation. NRIS will continue to improve current map products and design new maps to serve the Montana Drought Advisory Committee and Montana's citizens.

GEOGRAPHIC INFORMATION SYSTEM

GIS

During fiscal year 1992 the GIS continued to expand the products and services offered to a growing number of clients. Utilization of GIS by scientists, managers, and other parties interested in activities with geographic components is becoming routine. As the GIS user group grows, and as the users become more sophisticated, the GIS program finds itself under increasing demand, and continually challenged, to provide data and services to its expanding client base.

Fiscal year 1992 saw many changes in the GIS program. Staff changes in NRIS and the GIS, major technical changes, and major changes in client relationships all influenced the program. The challenge for the GIS is to continue to manage these changes so they have a positive influence on the program and fuel the development of a stronger program capable of providing improved services.

1992 GOALS

Provide technical assistance to Montana GIS users.

The primary service NRIS GIS performs is providing technical assistance to GIS users across the state. The GIS staff's high level of technical expertise is our greatest asset and, as such, we try to make it available to as many GIS users as possible.

Provide GIS production services.

Providing the highest quality GIS services possible in a timely manner in an ongoing challenge and goal of the GIS.

Participate and lead in standards development.

Data and system standards are the foundation that GIS in Montana builds on. As a promoter of GIS development in Montana, a major function for the NRIS GIS is the coordination of standards development and use.

Facilitation of resource sharing.

One of the primary missions of the GIS is the facilitation of the shared use of technical, financial, and professional resources applied to GIS. By sharing resources GIS applications can be made available to the most people, in the most professional manner possible, at the least cost.

Promote use of GIS by resource managers, scientists, educators and the general public.

Another goal of the GIS is to promote the use of GIS technology to facilitate natural resource information dissemination. We feel this goal is best accomplished by taking a proactive stance in making GIS technology available to all sectors of society who have an interest in natural resource information.

Develop and share new and emerging GIS technologies.

The extensive experience of the GIS staff allows us to evaluate new developments in GIS technology so that State users can take advantage of them.

Make public sector GIS data available.

Many public agencies have made significant investments in GIS databases. Publicizing the existence of these databases will maximize their usefulness.

Facilitate opportunities for joint funding of projects to create statewide basemap data.

The expense of GIS databases often preclude their creation when only one organization pays all of the development expense. By coordinating the joint funding of GIS database development, access to GIS applications can be spread to a greater number of organizations.

Promote GIS use through education.

Education is a key factor for the continued growth and development of an emerging technology like GIS. A major function of the NRIS GIS is to facilitate opportunities for GIS users across Montana to learn about basic concepts and new trends in GIS.

1992 ACCOMPLISHMENTS

Services Provided

During FY 1992, the GIS provided a wide range of services. New hardware and software installed during the year not only allowed GIS staff to fulfill requests more efficiently, but also permitted new types of processing.

The GIS provides many data and services on a non-contractual basis. Any request for data from a governmental agency or a non-profit entity would generally fall into this category. For example, a state agency requested a river and streams database for the entire state. NRIS was able to supply a 1:100,000 scale data base developed by the United States Geological Survey in a format that was compatible to their GIS.

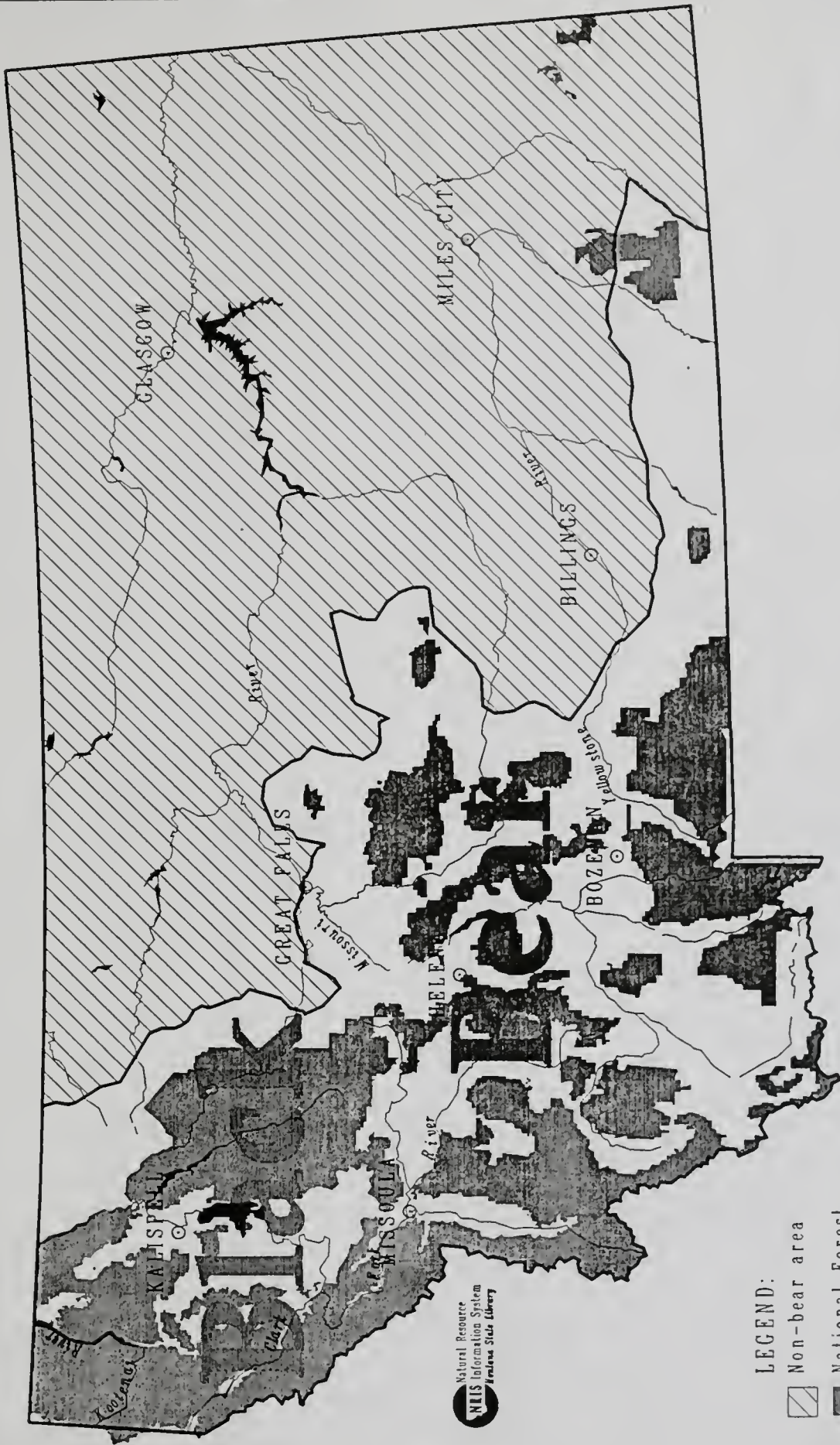
Non-contractual services are often in the form of custom maps. One request of this type during FY 1992 required the development of three maps for Fish, Wildlife, and Parks. This project required map production and data creation services. The maps developed were for Proposed Black Bear Management Units, Black Bear Distribution, and Fish, Wildlife, and Parks Regions. See maps on the following pages.

NRIS also provides technical support to GIS users. The initial phases of GIS implementation often require the highest level of technical expertise at a time when staff are most inexperienced. The NRIS GIS program assists users in all levels of GIS development to ease this transition period.


In the table below is a summary of all GIS services by type of product. The program fulfilled 205 requests for a total of 683 products. Most of the requests were for maps, but there is a growing and significant number of requests for copies of GIS data layers (212 layers were supplied to patrons). See Appendix B for the breakdown of requests by agency.

FY 1992 GIS Services Summary

Total Requests	Maps	Reports	Programs	Data	Other	Total Products
205	448	12	5	212	6	683

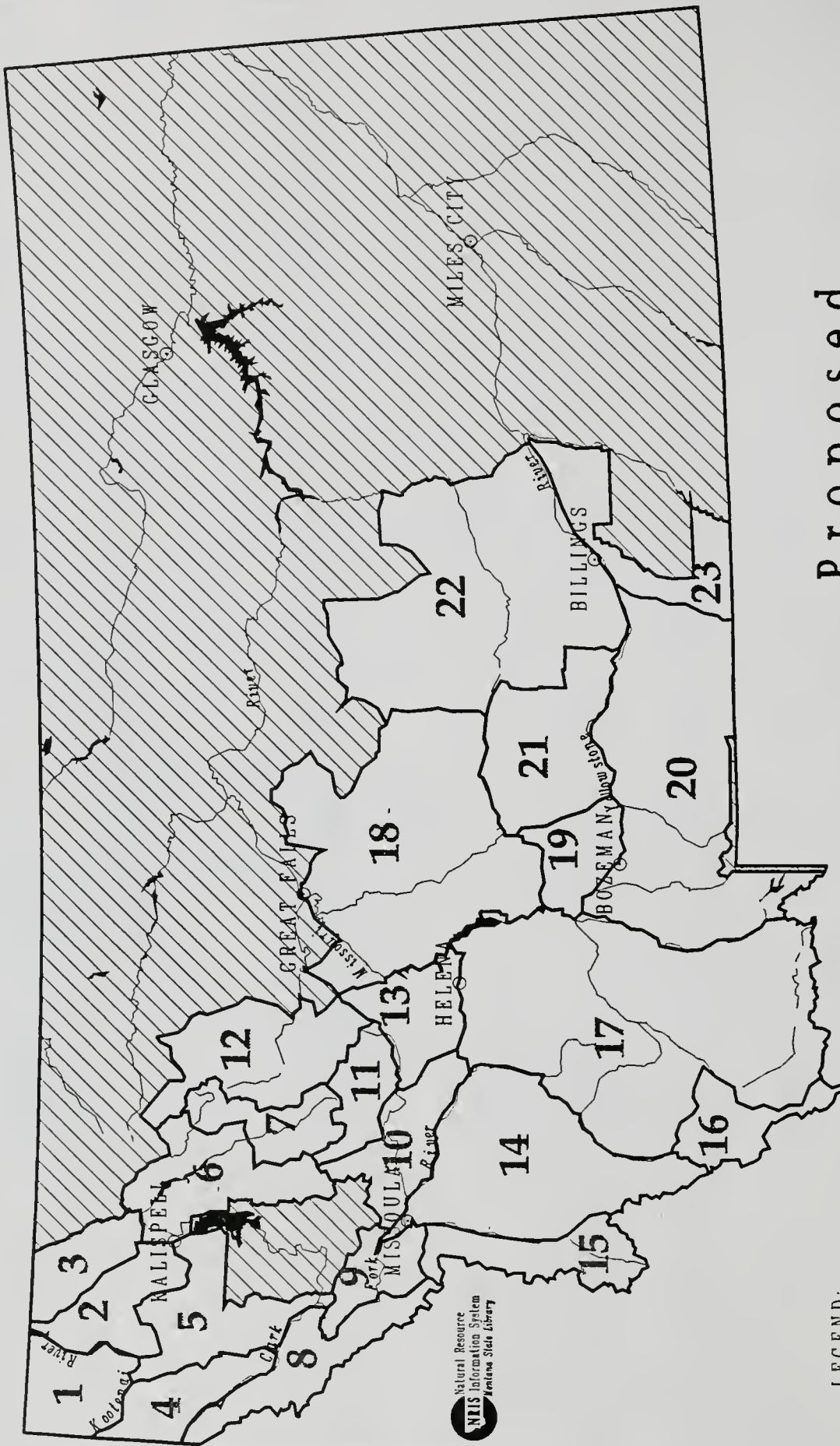


LEGEND:

 Non-bear area

 National Forest

Black Bear Distribution in Montana



Proposed Bear Management Units

LEGEND:

Non-management area

Administrative boundary

Montana GIS Users Group

The NRIS GIS plays an active role in the Montana GIS Users Group. The user group is a non-profit consortium of government agencies and business involved with GIS technology. The main activities of the users group are the annual users conference and publication of the *Montana GIS News*.

The annual Montana GIS User Conference provides an opportunity for individuals interested in GIS to share ideas and experiences. The 1991 conference in Bozeman (December 1991) attracted over 250 people despite bad weather and interstate road closures. NRIS helped with the conference by providing administrative support, active participation on the planning committees, and project presentations.

The *Montana GIS News* is designed to facilitate the transfer of information about GIS data, activities, and projects in Montana. The newsletter is published by NRIS for the Montana GIS User Group. There were two issues published during FY 1992.

Montana Interagency GIS Technical Working Group

The Montana Interagency GIS Technical Working Group (TWG) is a forum for the exchange of information regarding the acquisition of new GIS data, the existence of current GIS data, and information relating to GIS projects. NRIS supports the TWG by providing administrative support and actively participating in meetings and sub-committees. Major accomplishments for the TWG during FY 1992 were publication of the *Montana Geographic Information Systems Standards Plan* and the signing of Interagency Memorandum of Understanding.

The *Standards Plan* provides a framework for cooperation among the various federal, state, and local government agencies involved with GIS and standards of accuracy for GIS data. Allan Cox, the GIS Coordinator for NRIS during most of FY 1992 took a lead role in the development of the standards plan.

The Montana Interagency GIS Memorandum of Understanding (MOU) was signed by 18 state and federal agencies involved in GIS development and operation. The MOU documents an agreement to establish a vehicle for participating agencies and organizations to coordinate the development of geographic information systems (GIS) in Montana. The MOU encourages agencies to minimize the duplication of digital data, transfer technology and exchange data, develop data standards, and share resources in completing joint, interagency projects. Specific goals of the MOU are to:

- establish a cooperative effort to share digital data among the various resource management agencies and organizations within the state;
- make available all relevant, public domain, digitized databases managed by participating agencies;
- develop priorities for joint GIS development efforts and projects;
- investigate opportunities to jointly fund projects designed to create statewide, base map themes for Montana;
- develop and share new and emerging technologies to facilitate GIS products; and,
- promote the use of GIS by resource managers, scientists, educators, and where appropriate, the general public.

State Mapping Advisory Committee

The State Mapping Advisory Committee (SMAC) is charged with developing and submitting the state's cartographic requirements to the National Mapping Program of the U.S. Geological Survey (USGS). In Montana, both state and federal representatives are represented on the committee. NRIS coordination activities have helped make the Montana SMAC process very effective in acquiring data from the USGS. SMAC requests for FY 1992 will help support the mapping and GIS needs of nine state agencies and three federal agencies.

GIS Software Design

A new graphical display interfaced (GDI) was developed by NRIS for the ARC/INFO GIS software. This graphical interface allows faster and easier queries of the GIS databases and easy report/map production. The GDI program has been implemented by the NRIS GIS program; the NRIS-Water Information System; the Montana Natural Heritage Program; the Department of Fish, Wildlife, and Parks--Kalispell Regional Office; the Department of State Lands--Coal and Uranium Bureau; the U.S. Forest Service Regional Office in Missoula; the Montana Legislative Council; Information Services Division--Office of Policy, Research, and Development; Reserved Water Rights Compact Commission-DNRC; Yellowstone County; U.S. Bureau of Mines--Spokane Field Office; the University of Montana; and Montana State University.

GIS Seminars

For two years now, the NRIS Program has offered a series of GIS Seminars. The seminars are held once a month throughout the fall, winter, and spring. A GIS expert typically gives an hour long presentation to a wide variety of GIS users from governmental agencies and the private sector. The topics of the seminars range from software specific technical tips and tricks, to general information about topics such as cartography or new GIS projects in the state.

Staff Changes, Gifford, Cox, Daumiller, Lund

NRIS saw many GIS staff changes during FY 1992. Jon Sesso the NRIS program director resigned his position which was then filled by Allan Cox, the GIS Coordinator. Allan's former position was filled late in the year by Fred Gifford. Fred was the GIS Coordinator for the County of San Bernardino, California. Gerry Daumiller, who anchors the GIS technical staff, was promoted to Senior GIS Programmer/Analyst. Duane Lund was hired to fill the GIS Technician position which was left vacant by the resignation of Stu Kirkpatrick. Stu went to the Butte/Silver Bow planning department to establish a GIS there.

Projects Overview:

Department of Health and Environmental Services - Clark Fork Superfund Project

During FY 1992, funding for the Clark Fork Superfund Project was transferred from the U.S. Environmental Protection Agency (EPA) to the Atlantic Richfield Corporation (ARCO). This change resulted in service and data coordination for all parties involved in Superfund site remediation efforts on the Upper Clark Fork.

ARCO support for the Clark Fork GIS in FY 1992 allowed NRIS GIS to upgrade the system with new Unix workstations and a new color electrostatic plotter. This equipment enables the GIS staff to significantly increase productivity. For example, a 24" x 36" plot that took 4.5 hours to produce on the old pen plotter would only take 25 minutes to plot on the electrostatic plotter. Furthermore, the old pen plotter had a significant failure rate which resulted in many re-plots. This new capability allows the GIS staff to focus more of their time on productive activities.

The primary output provided by the Clark Fork GIS are maps. Some of the maps are simple basemaps depicting various physical features and some are the results of complex analysis that is best illustrated in graphic form. The reports generated varied from listings of existing data to the

results of spatial accuracy comparisons between two data themes. The data provided were usually supplied to various contractors who also have GIS capabilities. Following is a summary of production services supplied to users of the Clark Fork GIS during FY 1992.

FY 1992 Clark Fork GIS Services Summary

Total Requests	Maps	Reports	Programs	Data	Other	Total Products
105	268	4	0	55	4	331

The Clark Fork Technical Working Group (TWG) consists of representatives from various groups interested in the use of data systems to support planning and remediation efforts on the four Superfund National Priority List sites in the Upper Clark Fork Basin. NRIS provides administrative support to the Clark Fork TWG, the GIS Coordinator is the TWG chair, and the NRIS Director is on the TWG Executive Committee. Accomplishments during FY 1992 include development and indorsement of the *Clark Fork Data System Use Guidelines*; adoption of the *Montana Geographic Information Systems Standards Plan* developed by the Montana Interagency GIS TWG; oversight of GIS system re-tooling; update of the *Clark Fork Data System Project Plan*; transfer of funding from EPA to ARCO; increased level of data coordination (see example map on the next page); and overall improved oversight of the Clark Fork Data System.

Department of State Lands Support

During FY 1992, the GIS provided various services in support of the Department of State Lands (DSL) Coal and Uranium Bureau GIS. Final enhancements were made to the Powder River GIS user interface. This interface allows users with a minimal knowledge of GIS to do specific GIS functions. The GIS staff assisted DSL in the hiring process of a GIS technician by developing interview questions and participating in the selection process. Once the technician was hired, GIS staff provided initial training and technical support on the Unix workstation.

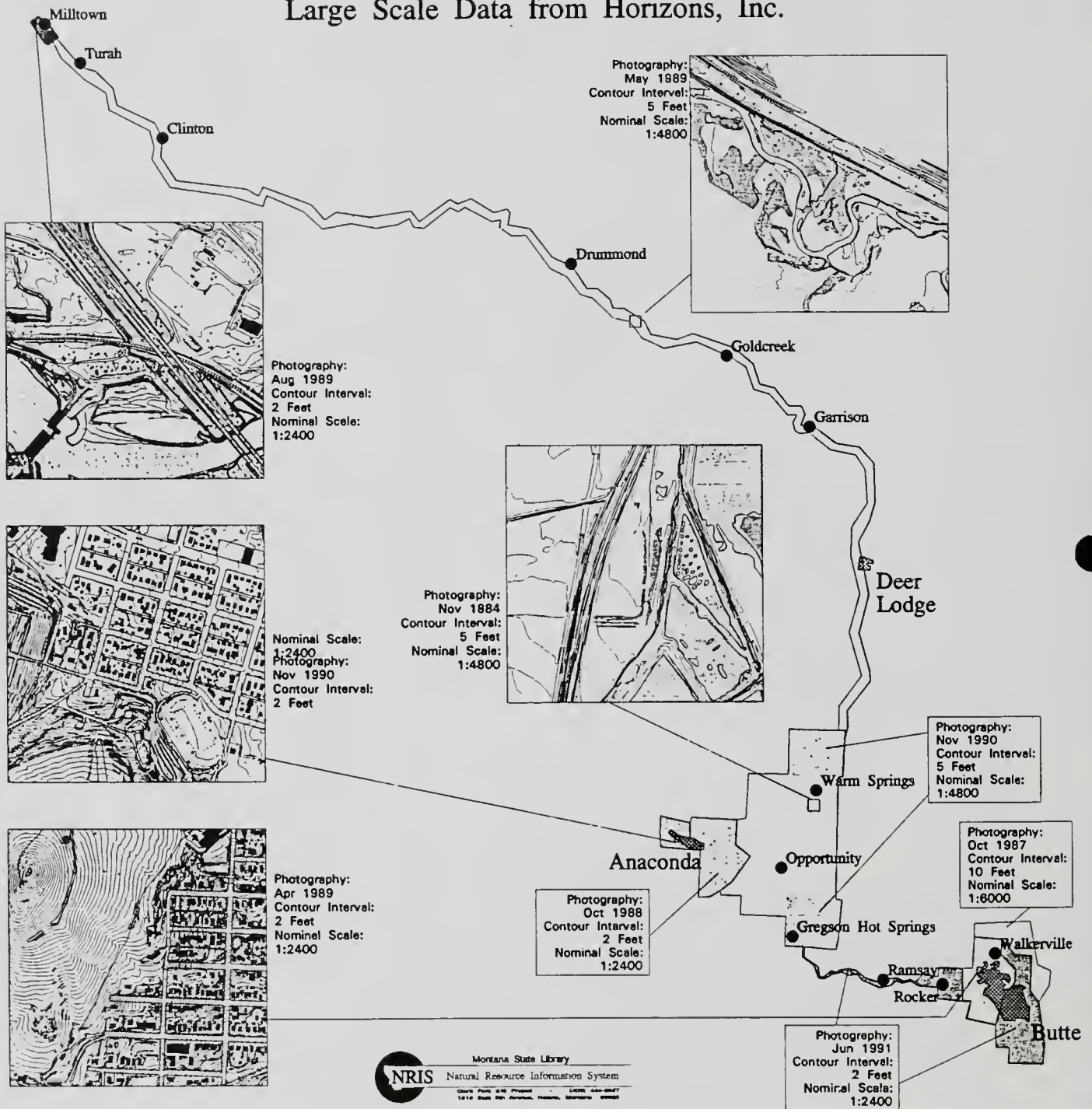
Legislative Council Support

Under an interdepartmental agreement between NRIS and the Legislative Council, the GIS provided technical support services for the Council's GIS legislative redistricting application. Assistance included technical advice on the selection and setup of a GIS; acquisition of data; training; and other technical support. Several ARC/INFO programs were developed to assist the Council staff with importing data into the system and producing maps. Currently, the GIS staff are editing the Census Bureau TIGER files used by the system to facilitate the production of better maps.

Department of Health and Environmental Services Water Quality Bureau (DHES WQB) Nutrient Source Assessment on the Clark Fork

The Nutrient Source Assessment project for the Clark Fork basin is a portion of the work required by Section 525 of the 1987 Federal Clean Water Act Amendments. In FY 1992, the GIS developed methods to visualize water quality conditions in the Clark Fork basin and created maps for reports and public meetings. In addition, the database of available map layers grew with the addition of STATSGO soils data, land use/land cover data, monitoring sites from other databases (STORET, WATSTORE, SNOTEL, and NOAA), and the identification of streams with nonpoint source assessments. Maps were produced to display nutrient (phosphorus and nitrogen) loads contributed to the Clark Fork River by wastewater treatment plants and tributary streams (see map in Appendix C), nutrient concentrations and algal levels in the Clark Fork River, nonpoint source assessments, monitoring site locations, land use information, and base map data for the basin. This project will continue through September, 1992.

Large Scale Data from Horizons, Inc.



Department of Health and Environmental Services Water Quality Bureau (DHES WQB) - Nonpoint Source Program

GIS support was provided to the Nonpoint Source Program administered by the State Water Quality Bureau. This support included identifying assessed streams and assigning assessment results as attribute data in the GIS database. A map was produced displaying the assessed streams and the assessment results. Additional support will be provided for this program during FY 1993.

Department of Health and Environmental Services Water Quality Bureau (DHES WQB) - Blackfoot River Support

A coalition formed to facilitate better natural resource management within the Blackfoot basin is investigating the use of GIS to support their efforts. The State Water Quality Bureau is supporting this project and is expecting GIS to play a key role in the resource management decisions. GIS technology has already been applied to the Blackfoot basin through the work done by EPA's Environmental Monitoring Systems Laboratory (EMSL) in Las Vegas, Nevada for the Section 525 project. At the direction of the WQB, NRIS is providing support for further work on the Blackfoot basin by participating in planning meetings and providing technical resources and expertise to Desktop Assistance, a nonprofit group who has contracted with the WQB to demonstrate the utility of GIS for this situation. During FY 1992, NRIS helped with presentations regarding EMSL's GIS system, provided data for the Blackfoot basin, helped with planning regarding the use of GIS for the Blackfoot basin, and installed and provided space for equipment to be used for the initial portion of the project.

Department of Natural Resources and Conservation - Energy Division

The NRIS GIS provided services to the Department of Natural Resources and Conservation's Energy Division in an environmental impact statement (EIS) for the rebuild of a power line near Libby, Montana. NRIS and DNRC used digital topographic data and GIS tools to examine viewsheds of various power line pole placement alternatives (see maps in Appendix C). This project included acquiring and developing several data sets and producing various map products. In addition, the GIS staff provided advice and technical assistance in other aspects of the EIS. In November of 1991, NRIS staff worked with DNRC staff to develop a proposal to Bonneville Power Administration for the acquisition of a GIS for the Energy Division. That proposal was partially funded in the Summer of 1992. During FY 1993, the Energy Division will acquire a Unix graphics workstation and ARC/INFO GIS software. NRIS will assist DNRC staff in the setup of the system and in the creation of a statewide GIS utility map layer.

Department of Natural Resources and Conservation Drought Project

During FY 1992, a grant was obtained by NRIS to enhance the State's drought reporting process by visualizing drought conditions through the production of maps. Maps showing the Surface Water Supply Index and the Palmer Drought Severity Index were produced monthly from February through the end of the fiscal year and are ongoing at this time. A system was set up to simplify importing the drought information into a GIS and the creation of the drought maps. Color copies of the maps are being mass produced on NRIS's electrostatic plotter for inclusion in reports produced by the Department of Natural Resources and Conservation and for use at meetings. Simplified versions of the maps were developed for use on television.

Washington State Energy Office/Bonneville Power Administration Project

Two major tasks were performed to support the development of the Generating Resources Database funded by the Bonneville Power Administration (BPA) and administered by the Washington State Energy Office (WSEO). The first task was the development of a proposal and needs inventory for data and equipment necessary for regional energy planning within the Pacific northwest. The proposal also outlined requirements for the Montana Department of Natural Resources and Conservation to efficiently and effectively evaluate future proposals for additional electrical generation and/or transmission capacity using GIS. The proposal and follow-up documents were submitted to WSEO for use in the development of a regional proposal to BPA.

The second task was a survey, requested by BPA, of all thermal electrical generation plants in Montana with a capacity greater than one megawatt. Survey forms were developed and mailed to a contact person for each plant. Copies of the completed forms were submitted to WSEO.

Natural Resource Damage Claim

The NRIS GIS provided various GIS services under contract to the Natural Resource Damage Claim (NRDC) in the Montana Department of Health and Environmental Sciences during FY 1992. A NRDC contractor was trained in basic GIS input techniques and allowed to digitize data using NRIS equipment. After the data were developed NRIS GIS staff did post-processing work to allow it to be used with the GIS. Several maps were produced for NRDC and GIS data was sent to the University of Montana which is also working on the project.

Helena National Forest Project

Under contract, NRIS is providing GIS technical assistance and map production services to the Helena National Forest. The project involves loading raw data supplied by Helena National Forest into the GIS and processing it for use in riparian applications. The major products developed under this contract are: a clean database of watersheds and landtypes for the Helena National Forest; a series of aggregate maps depicting combinations of geologic, land form, soil type, and other features (see map in Appendix C); a database indicating the cumulative acreage of each combination; a series of maps showing unstable soil types to be used in oil and gas lease management; a series of ownership maps for the Helena National Forest area; and, a map series indicating slope, aspect, and perspective views of the forest.

1993 GOALS

The future holds many challenges for the NRIS GIS. Like most government organizations, we are required to provide an increasing level of services with decreasing resources. We will strive to use our human and technical resources in efficient and creative ways to meet new challenges.

NRIS plans to continue to develop its geographic information system capabilities and databases. Specifically, we plan to link into the state ethernet to provide electronic data transfers with other state agencies and universities, as well as on-line access to the NRIS system.

The high cost of entry into GIS technology continues to be the largest obstacle to its utilization. We will try to leverage the resources of NRIS so that as many GIS users in Montana as possible can take advantage of existing data, equipment, and knowledge. This goal will be accomplished through outreach efforts to publicize the resources that are currently available.

Data and system standards are a key element in the successful integration of GIS into natural resources management for Montana. NRIS will continue to actively promote standards in all appropriate areas of GIS. Furthermore, we will work to insure that standards previously adopted are adhered to.

GIS is an enabling technology that allows the integration of data sets that have not traditionally been viewed as being related. Therefore, we feel it is important to integrate data that have not traditionally been thought of as natural resource information into the GIS. This integration will allow natural resource information to be analyzed in the context of all activities that influence it.

As part of the Montana State Library, we must be advocates for access to GIS information. NRIS will continue to stay at the forefront of data access issues so that all parties interested in GIS data will have equal access.

NRIS has a specific goal for the next biennium to work with the Department of Administration's Information Services Division to develop a mechanism to provide GIS developmental and technical assistance services to state agencies.

APPENDICES

Appendix A: NRIS Service Evaluation Letter and Form

Appendix B: Profile of NRIS Users: Charts/Graphs

Appendix C: Examples of Information Requests

Appendix D: New NRIS Information for FY 1992

Appendix E: NRIS Factsheets

Appendix A: NRIS Service Evaluation Letter and Form

September 30, 1992

Dear NRIS Patron:

The Montana Natural Resource Information System (NRIS) was formed in response to the growing need for quick access to the increasing amounts of natural resource information. NRIS was designed ... ***to be a comprehensive program for the acquisition, storage, and retrieval of existing data relating to the natural resources of Montana.*** In 1985, NRIS began by providing services through its Montana Natural Resource Index and the Montana Natural Heritage Program. In response to growing user needs, the program has expanded to include the Montana Water Information System and the NRIS Geographic Information System. NRIS now offers a wide variety of data management, information indexing, and data retrieval services.

In an effort to continue to respond to user needs and to improve our services, we need your help. With your information request, we are enclosing a service evaluation form. Please help us better serve you by taking a few moments to fill it out. If you have any questions or want further information, please do not hesitate to call me or Pam Smith at 444-5354. In particular, if you encountered any problems with your request or were dissatisfied with the service you received, please contact me.

Thank you for your help and I hope we can be of service to you again.

Sincerely,

Allan B. Cox, Director
Montana Natural Resource Information System

Natural Resource Information System Service Evaluation

Dear Patron: Please help us improve our service by giving frank answers to as many of the following questions as you can. Please return this form to: NRIS, Montana State Library, 1515 East 6th Ave, Helena, MT 59620 or Fax to (406) 444-0581. Thank you.

1. Did NRIS provide you with the information you requested? ☐ Yes ☐ No
2. How much of the information supplied did you apply or use? ☐ < 25% ☐ 25%-50% ☐ 50%-100%
If you used "less than 25%" of the information supplied to you, please explain if NRIS supplied unnecessary or unusable information.
3. How dependent were you on NRIS to provide the information?
☐ Very Dependent ☐ Somewhat Dependent ☐ Had other reliable source
4. Please estimate any financial benefits your department/project may have realized from the use of this information.
☐ < \$1,000 ☐ \$1,000 to \$5,000 ☐ \$5,000 to \$20,000 ☐ > \$20,000 (Specify) _____
5. Was the information given to you in a form that you can use? ☐ Yes ☐ No
If NO, please explain why:
6. Did you receive the information on time? ☐ Yes ☐ No
7. In addition to this information request, how often have you used the services that NRIS provides?
☐ Once a week or more ☐ 1-3 times per month ☐ Several times a year ☐ About once a year
☐ This was my first NRIS information request.
8. How important was it for you to obtain this information?
☐ Very important ☐ Somewhat important ☐ Not very important ☐ Not at all important
9. Did you verify the accuracy of the information we provided you? ☐ Yes ☐ No
If YES, was the information/data accurate?
10. Do you have any comments or suggestions that might improve the services we offer?
11. Please indicate the organization type you represent:
☐ Federal ☐ Private (For Profit) ☐ Private (Non-Profit) ☐ State ☐ Academic ☐ Individual ☐ Other (specify)

If you wish us to contact you concerning your answers or if you encountered problems with service, please give your name and phone number.

Name: _____

Phone: _____

Appendix B: Profile of NRIS Users: Charts/Graphs

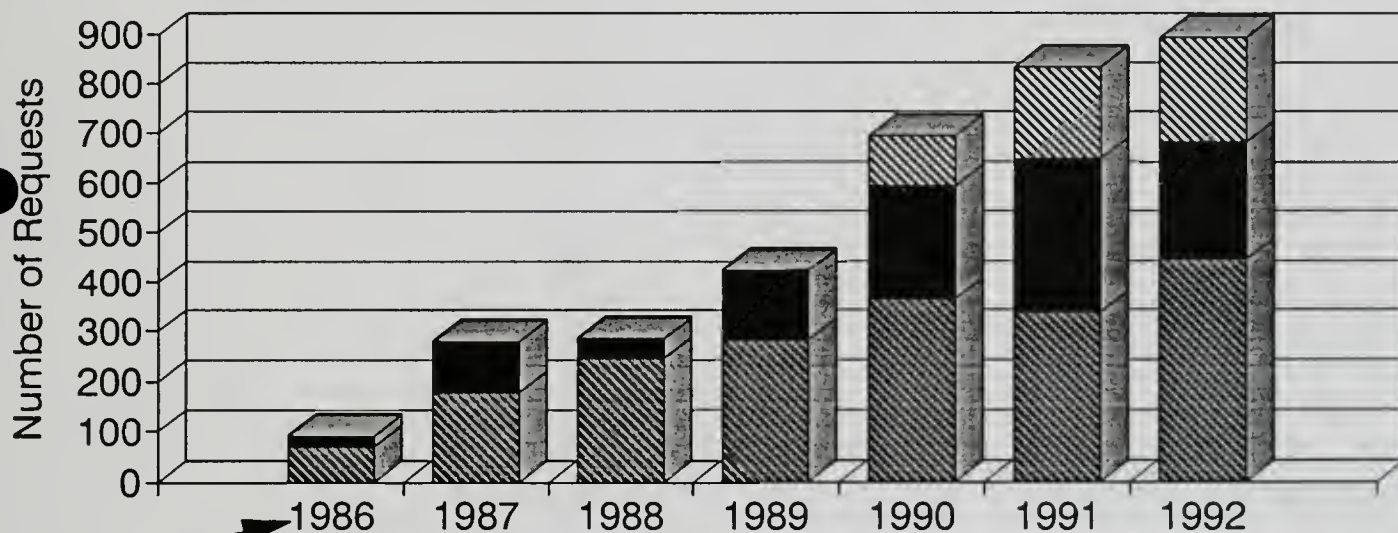
1. NRIS Data Requests by Fiscal Year
2. NRIS Users by Sector
3. NRIS Users by State Agency
4. Natural Heritage Program Users by Sector
5. Natural Heritage Program Users by State Agency
6. Water Information System Users by Sector
7. Water Information System Users by State Agency
8. Geographic Information System Users by Sector
9. Geographic Information System Users by State Agency



Natural Resource Information System

Data Requests by Fiscal Year

Heritage NRIS / Water GIS



HERITAGE Start-up
October, 1985
NRIS Start-up
January, 1986

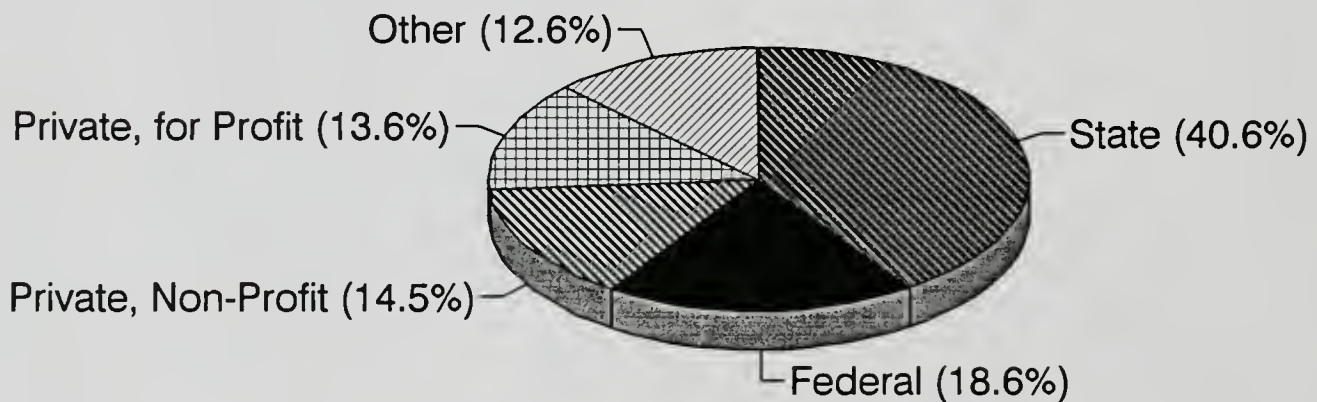
WATER System
Fully Operational

GIS Services
Available

Natural Resource Information System Users by Sector

Natural Heritage Program, Water Information System
Geographic Information System

Total Requests: 895

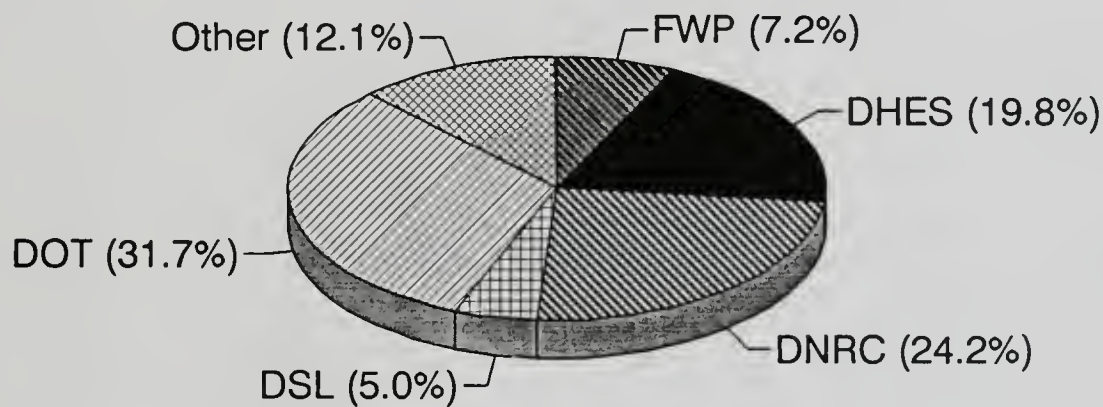


Period of Record: FY 1992

Natural Resource Information System Users by State Agency

Natural Heritage Program, Water Information System,
Geographic Information System

Total Requests: 362

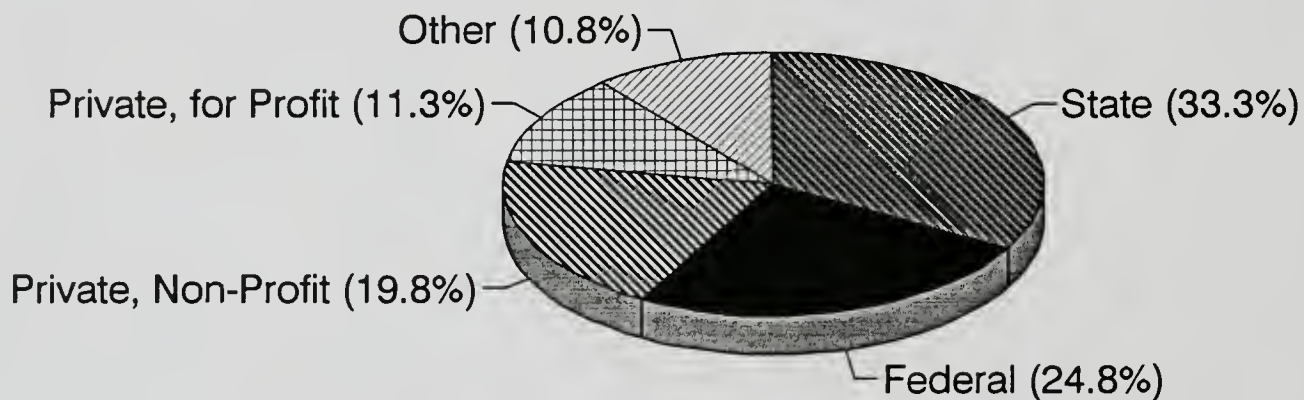


Period of Record: FY 1992

Natural Heritage Program Users by Sector

Natural Resource Information System

Total Requests: 444

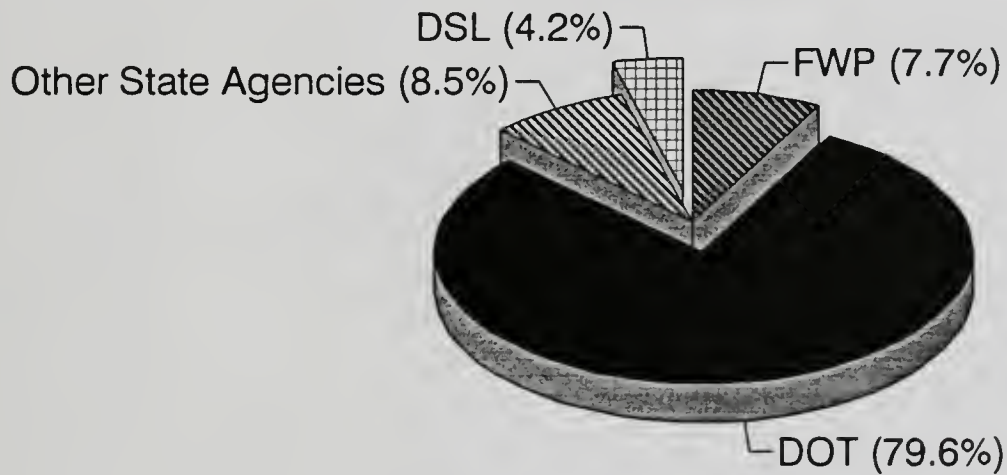


Period of Record: FY 1992

Natural Heritage Program By State Agency

Natural Resource Information System

Total Requests: 142

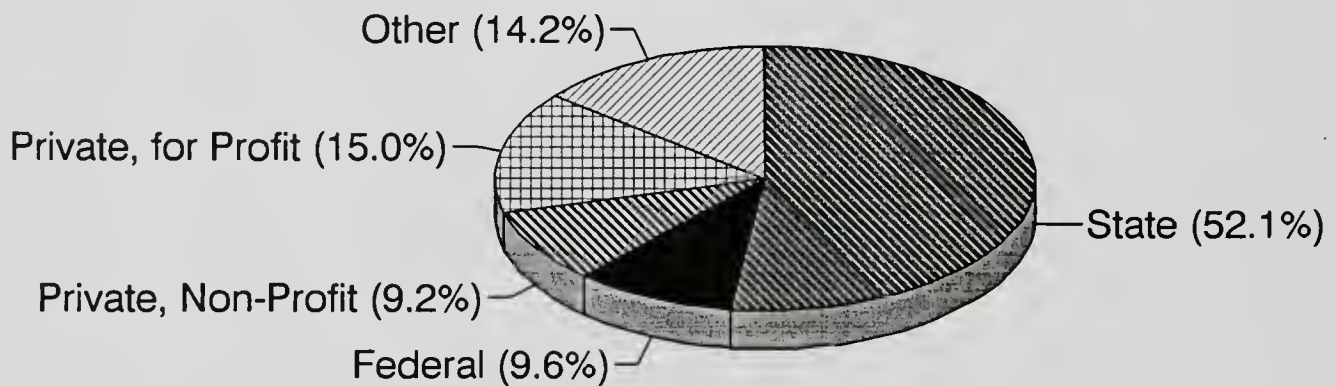


Period of Record: FY 1992

Water Information System Users by Sector

Natural Resource Information System

Total Requests: 240

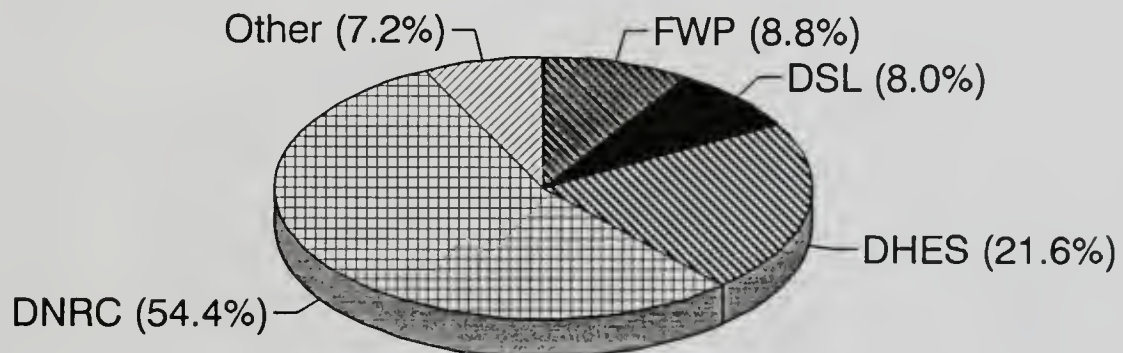


Period of Record: FY 1992

Water System Users By State Agency

Natural Resource Information System

Total Requests: 124

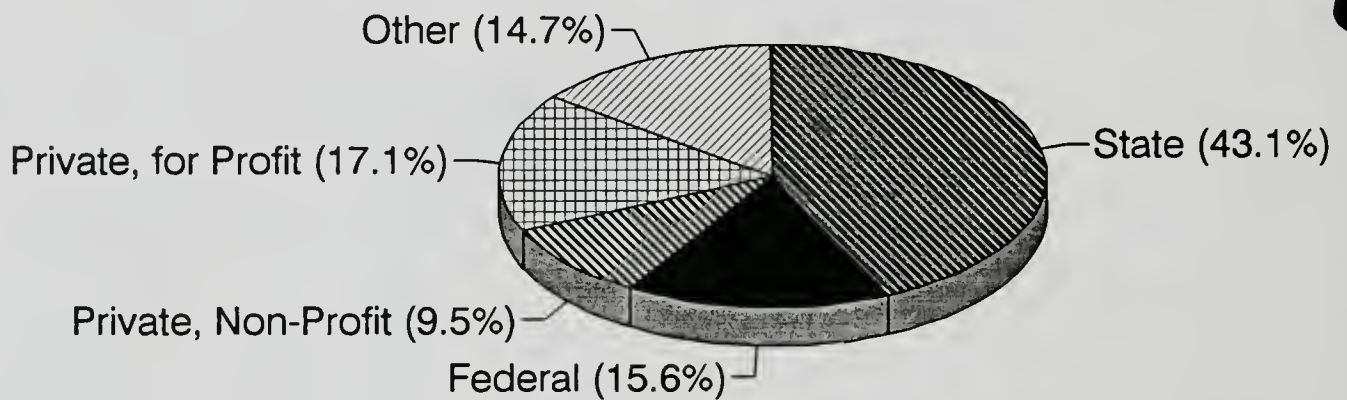


Period of Record: FY 1992

Geographic Information System Users by Sector

Natural Resource Information System

Total Requests: 211

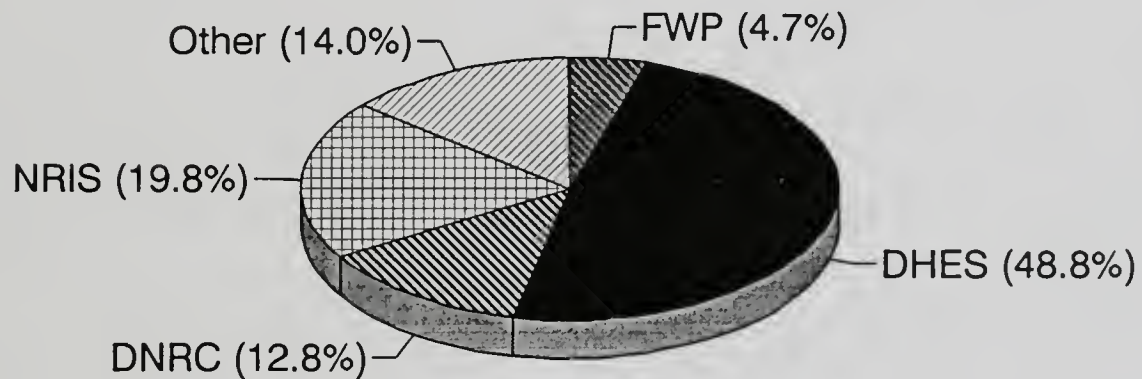


Period of Record: FY 1992

Geographic Information System By State Agency

Natural Resource Information System

Total Requests: 90



Period of Record: FY 1992

Appendix C: Examples of Information Requests

STATE AGENCIES

◆ A request for locations of data collection sites and summaries of river related resources and water quality data was received from a state agency for the state resource damage claim program. NRIS retrieved river resource data from the Montana Rivers Information System, a data base developed by the Department of Fish, Wildlife and Parks (FWP), and water quality data from STORET.

◆ For the Departments of State Lands and Fish, Wildlife and Parks, the Montana Natural Heritage Program supplied significant information and technical assistance on various projects. Some examples include:

- Details on the status of the white pelican, black tern, and northern bog lemming in Montana, including information on banding techniques for pelicans;
- Information on the locations of sensitive species in the Thompson/Chain-of-lakes area;
- A listing of the location and status of sensitive species located on DSL-administered lands;
- Verifications of various bird sightings;
- Recommendations on map filing and reference systems;
- Background information on 21 common species known to occur in the vicinity of a proposed coal mine, along with detailed reports on two sensitive plant species potentially occurring in the same area;
- Comments on a reclamation project in Carbon County;
- A summary of sensitive bat species in Montana, including information on monitoring techniques and equipment;
- A compilation of data on both sensitive and common species found in the Clark Fork drainage;
- Updated lists of animal and plant species of special concern in Montana.

◆ A state agency needed data for use with development of a GIS for the Blackfoot/Clearwater game management area. A review of existing data in that area revealed the following themes of information were available: hydrography, water-bodies, subwater sheds, national forest boundaries, and roads. The agency also wanted information on rare or endangered plant and animal species and biological communities data from the NRIS Natural Heritage Program database. All the data was provided in a format compatible with the agency's GIS.

FEDERAL AGENCIES

◆ To support a streamflow and reservoir modelling effort, a federal agency requested precipitation and temperature summary statistics for three stations. NRIS accessed the USSCS SNOTEL data base and EarthInfo. compact disks. Daily values and summary statistics were provided and the files were up-loaded to the U.S.Geological Survey computer in Helena via on-line transfer.

◆ A federal agency had existing GIS data that required quality assurance checking and enhancements before it could be used for their application. The data themes included landtype and watershed boundaries. Multiple map files for each theme had to be merged into a continuous map file and edgematched. Both of these tasks were performed using automated GIS tools. Many coding errors (approx. 250) were found when the map boundaries were matched. A program was written to assist the client in correcting the errors. Next topological data structures used by the GIS were added. Finally, attributes for each map element were converted from ASCII files to GIS attributes.

PRIVATE SECTOR

◆ County officials contracted with a consultant to conduct a county-wide study on ground water availability and quality. The consultant requested a comprehensive search for existing data. NRIS provided bibliographic listings of geologic and hydrologic investigation for the county and adjacent areas. Water quality data were also provided from STORET, a data base operated by the U. S. Environment Protection Agency (EPA).

◆ A private corporation requested detailed planimetric map data in a electronic graphic interchange format for the Anaconda area. The data will be used for a beryllium disposal study. After consultation with the client it was determined that a hardcopy map of the area would better fit their needs. Four maps were generated for the client.

PRIVATE NON-PROFITS

◆ A private conservation group requested a broad range of information to support development of a stream assessment report for Smith River area. NRIS delivered data from a variety of sources including the USGS WATSTORE, EPA STORET, FWP MRIS, and others.

◆ A private conservation group requested topographical and soil parameter information about selected points in a Blackfoot River study area. The points were overlaid on a triangulated irregular network (TIN) coverage to get slope, aspect, elevation of each point. A soils database from the Montana Soils Conservation Service was imported into the GIS and processed to provide client with a list of soil parameters. The client processed this list and created two plant growth indices for each area. The client will use this data to classify each point's potential need or value as a protected area. A map was produced to support client's report.

TRIBAL GOVERNMENT

◆ Water Resource officials from the a Montana tribe requested comprehensive searches for water quality data on or adjacent the reservation. The Tribal governments are conducting water quality assessments in conjunction with the Clean Water Act. NRIS conducted comprehensive searches to locate data collection sites that will be useful in the water quality assessments. Data sources accessed include USGS WATSTORE, EPA STORET, Montana Bureau of Mines and Geology (MBMG) Ground Water Information Center (GWIC), and others.

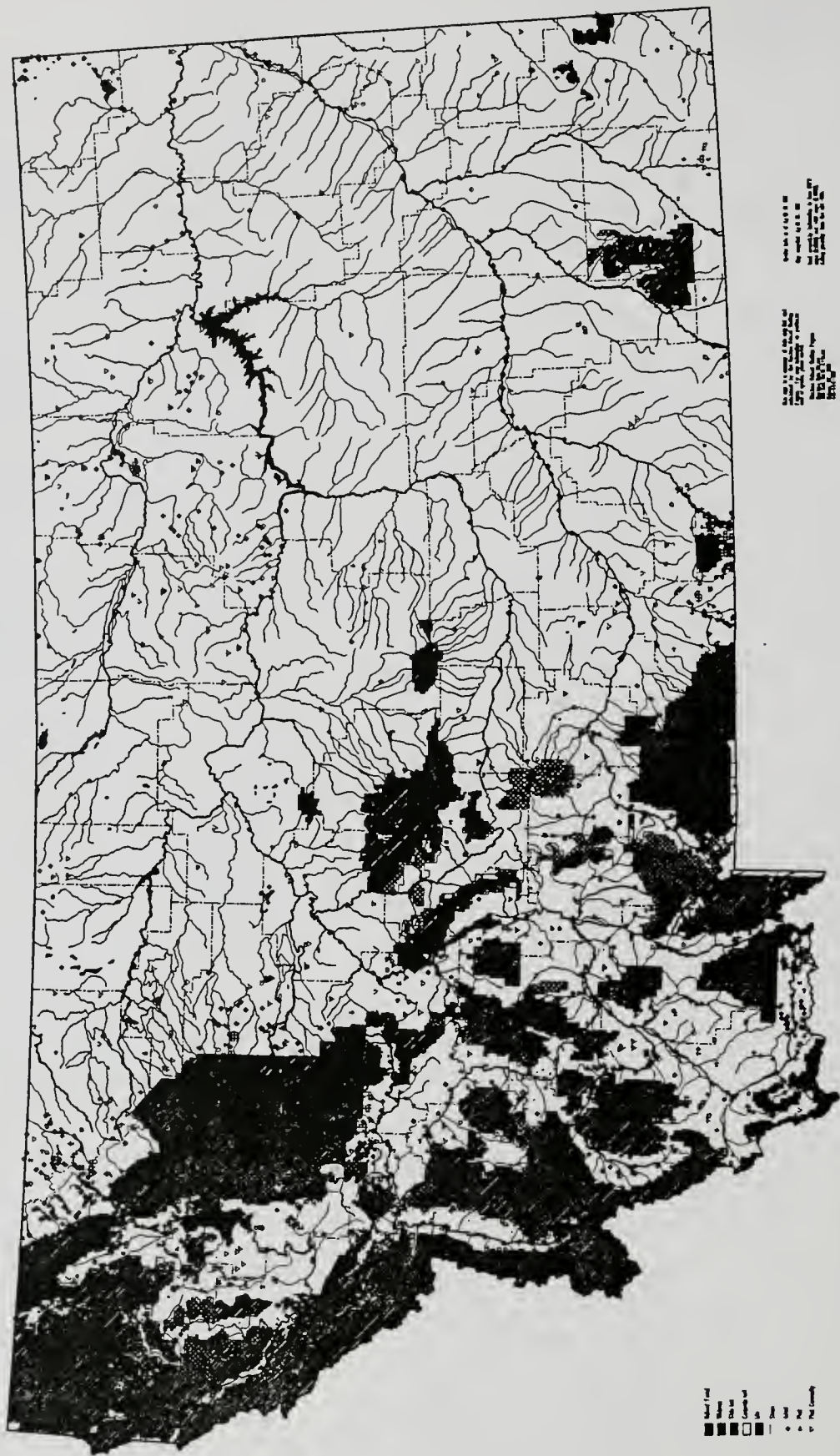
ACADEMIC

◆ A visiting researcher at the University of Montana, Yellow Bay Biological Research Station, is conducting a study of glaciers and their movement in Glacier National Park. Historical and current data are needed to support the research. NRIS provided streamflow data from the U. S. Geological Survey (USGS) WATSTORE data base and from the EarthInfo. Inc. compact disks. Precipitation and other climate data were also provided from the EarthInfo. compact disk products.

◆ The Canyon Ferry Limnological Institute, a special summer camp for gifted high school students, requested assistance locating and obtaining water quality studies and data for the Canyon Ferry area. NRIS accessed a variety of sources, including the Montana State Library Information Resources, and provided bibliographic listings, data printouts, and machine readable data.

◆ A forestry professor at a Montana university requested various GIS data sets for use in the school's GIS system. GIS data supplied included an index of USGS maps and National Forest boundaries. A tabular database file was also provided that included data dictionary descriptions of the GIS themes provided. The GIS data dictionary contains detailed information describing the data themes, information provided in the data dictionary includes: brief description, scale, source, attributes, projection, development method, and quality control information.

Distribution of Species of Special Concern in Montana



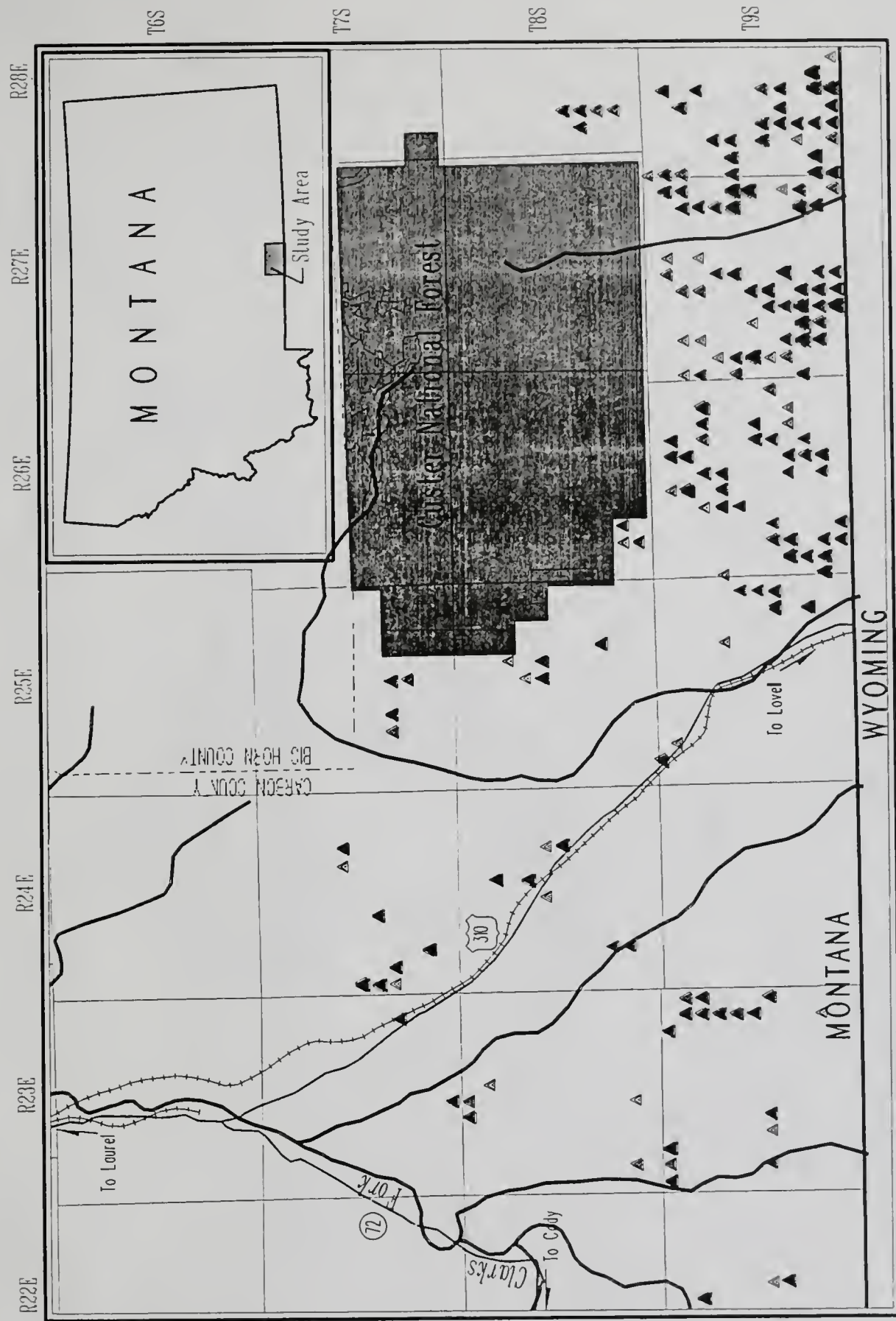
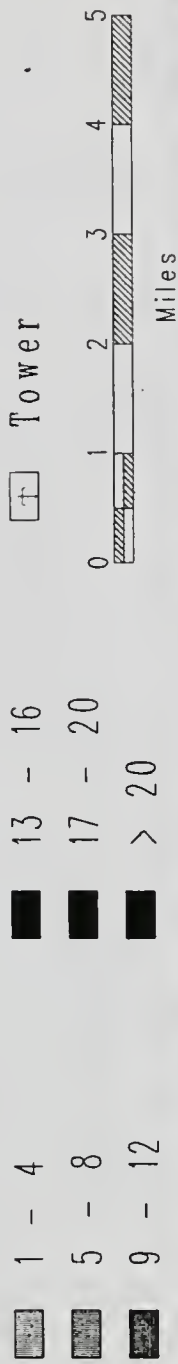


Figure 2.: Location of surveys for species of special concern

Viewshed for Powerline Segment 46



Perspective View of Flagstaff Mountain
































Viewpoint is from Libby Drive-in



- Right-of-way Alternative 46
- Right-of-way Alternative 47
- Service Roads for Alternative 46
- Service Roads for Alternative 47
- Roads Proposed for Mitigation

Helena National Forest

Aggregate Map Clip 2

-  LIMESTONE / MOUNTAIN SLOPES & RIDGES
-  BASALTIC ROCK / MOUNTAIN SLOPES & RIDGES
-  METASANDSTONE ROCK / MOUNTAIN SLOPES & RIDGES
-  METASANDSTONE & BASALTIC ROCK MOUNTAIN SLOPES
-  MISO COLLUVIAL DEPOSITS
-  MISO LANDSLIDES
-  MISO BEDDING / MOUNTAIN RIDGES (ALPINE SHADOWS)
-  LIMESTONE & METASANDSTONE ROCK / MOUNTAIN SLOPES
-  HYDROTIC ROCK / MOUNTAIN SLOPES & RIDGES
-  GRANITE ROCK / MOUNTAIN SLOPES & RIDGES
-  GRANITE ROCK / ROLLING UPLANDS
-  LIMESTONE / SP SLOPES
-  LIMESTONE / STRUCTURAL BIRMLANDS
-  METASANDSTONE & BASALTIC ROCK / STRUCTURAL BIRMLANDS
-  METASANDSTONE / STRUCTURAL BIRMLANDS
-  METASANDSTONE / STRUCTURAL BIRMLANDS
-  ANCHORED BEDDING / STRUCTURAL BIRMLANDS (SLOPES)
-  BASALTIC ROCK / ROLLING UPLANDS
-  METASANDSTONE ROCK / ROLLING UPLANDS
-  METASANDSTONE & BASALTIC ROCK / GLACIAL TROUGH VALLS
-  METASANDSTONE ROCK / CIRCLE BASINS
-  GRANITE ROCK / GLACIATED MOUNTAIN SLOPES
-  GRANITE ROCK / GLACIAL TROUGH VALLS
-  GRANITE GLACIAL TLL BEDDINGS
-  COMPACT LIMESTONE GLACIAL TLL / BEDDINGS
-  BASALTIC & METASANDSTONE COMPACT TLL / BEDDINGS
-  FRAGILE LIMESTONE GLACIAL TLL / BEDDINGS
-  METASANDSTONE BEDS & TLL (GLACIATED MOUNTAIN SLOPES)
-  ALLUVIAL BEDDINGS / FLOODPLAINS & TERRACES
-  ALLUVIAL BEDDINGS / FLOODPLAINS & TERRACES
-  ALLUVIAL / PADS



Scale of Miles

Clark Fork Basin Superfund Sites

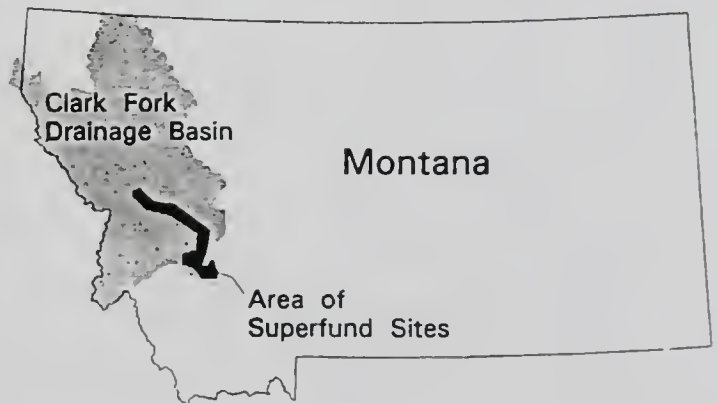
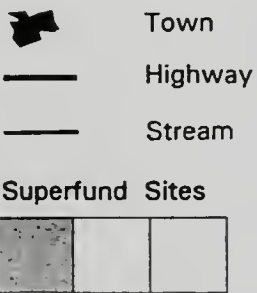
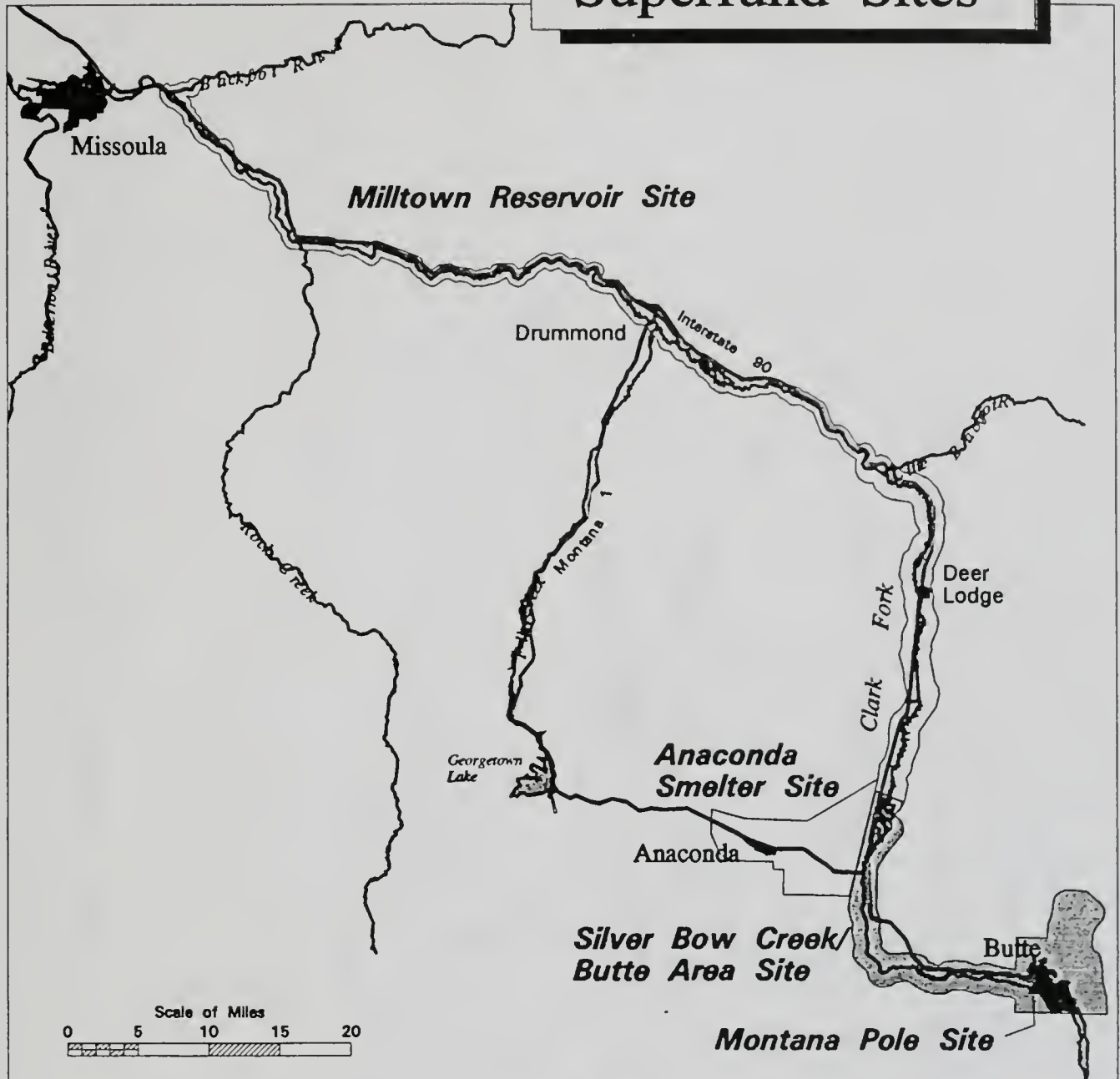
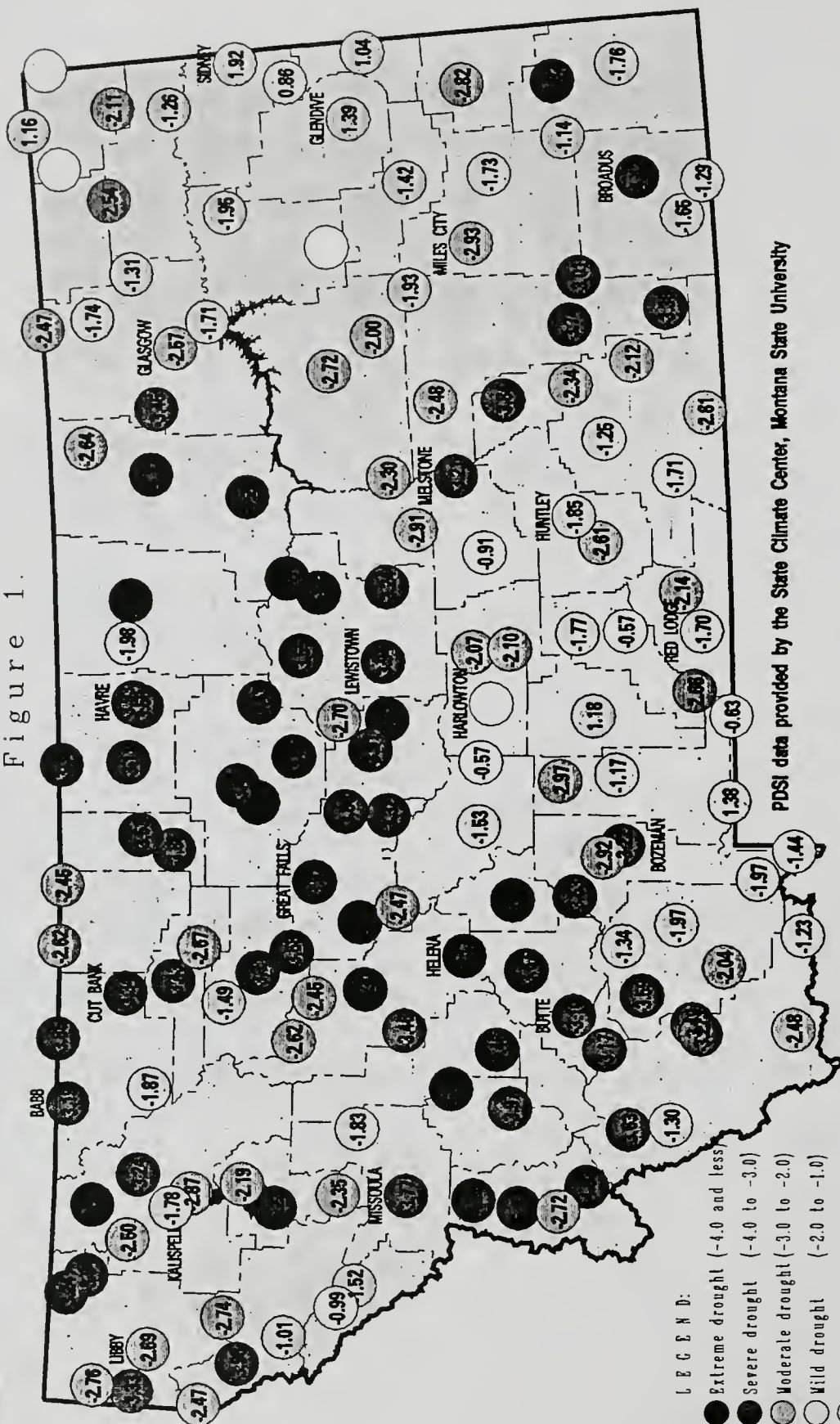


Figure 1.



Palmer Drought Severity Index (PDSI) Values: July 1, 1992

NOTE: PDSI values are primarily an indicator of moisture conditions on non-irrigated prairie lands.

Map of Montana showing strychnine use restrictions. The map is divided into three main regions: 'Prohibited' (hatched area in the west), 'Restricted' (hatched area in the south), and 'Use' (hatched area in the east). Major cities and towns labeled include Glasgow, Miles City, Billings, Bozeman, Helena, Dillon, and Great Falls. Highways 2, 89, 15, 200, and 90 are shown. A legend indicates 'National Forest' with a hatched pattern. Text at the bottom right reads 'Use of strychnine baiting for'.

Strychnine Use Restrictions in Montana

Use of strychnine baits for ground squirrel control is permitted May 1 through October 31 except as noted in Use Restrictions 2a, 2b and 2c.

See Use Restriction 2c.

Work request: 92-NRIS-61

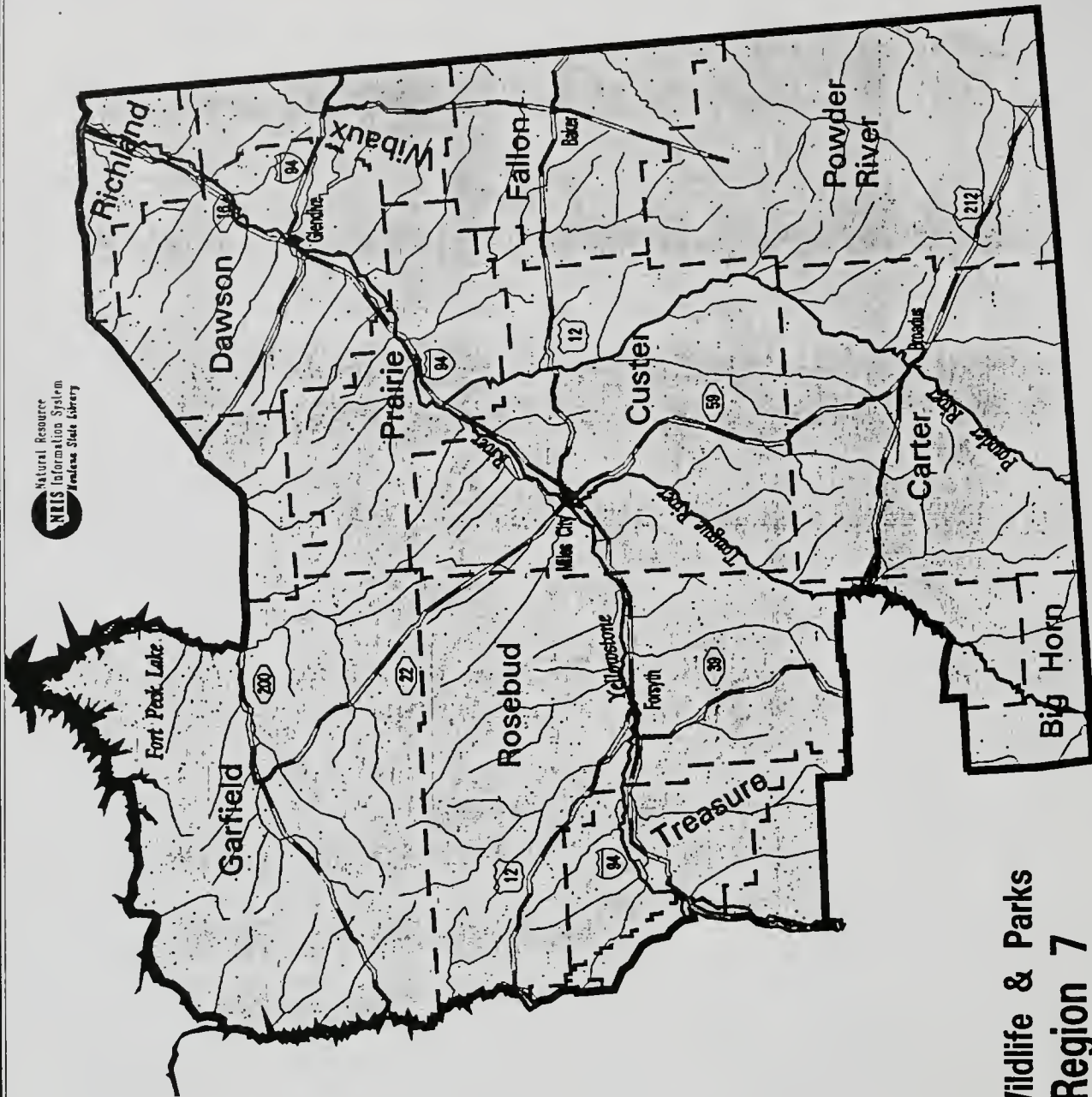
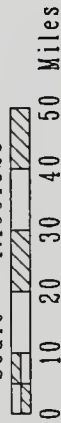
June, 1992



L E G E N D:

- Administrative boundary
- - County boundary
- Stream
- == Highway

Scale = 1:1991328



Natural Resource
NRTS Information System
Indiana State Library

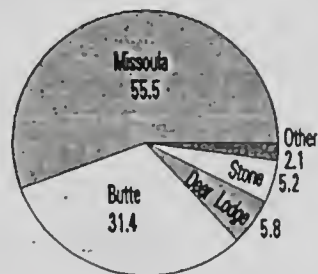
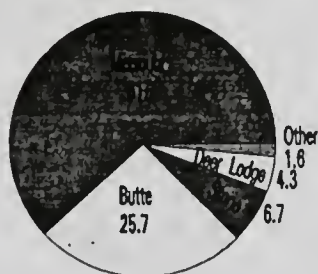
Montana Department of Fish, Wildlife & Parks Administrative Region 7

Clark Fork Basin Montana

Percent Contribution by Point Source

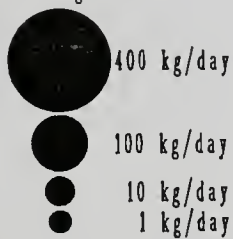
Soluble N

Soluble P



LEGEND:

Average soluble inorganic nitrogen load:



Average soluble phosphorus load:

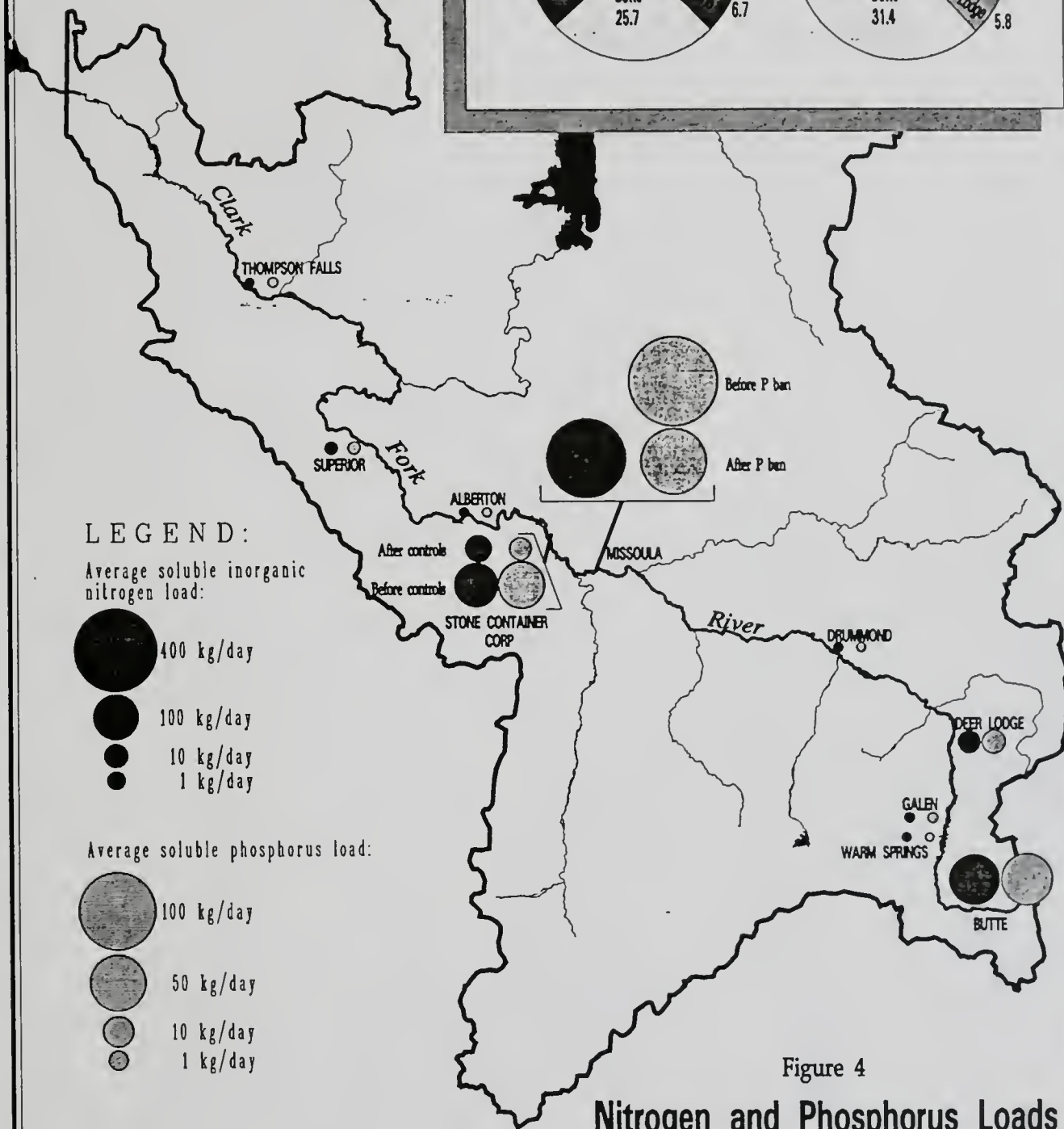
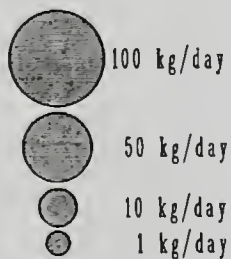


Figure 4

Nitrogen and Phosphorus Loads from Point Sources



Appendix D: New NRIS Information for FY 1992

NATURAL HERITAGE PROGRAM

- 483 new location records for sensitive species were mapped and computerized; 1089 new bibliographic sources were computerized; taxonomic and status records were computerized for 110 species, and 21 biologically significant areas were mapped, characterized and computerized.
- Approximately 27 technical reports on sensitive species or communities were completed.
- Methods and standards were established by the program, and data bases were expanded to allow management of interagency natural areas data in Montana.
- Approximately 200 1/10-acre vegetation sampling plots were established in south-central and southwestern Montana, with an additional 200 planned for FY 93. These will serve as baseline indicators of general environmental conditions, as well as help in identifying areas of particular concern or with specific management requirements.
- Ca. 23,000 records of bird sightings, for the publication of the fourth edition of *Montana Bird Distribution*, were compiled and computerized, including 10,000 records from the third edition, and 13,000 new records for the fourth. Information continues to be solicited and processed.
- Ca. 1200 new USGS 7 ½-minute quad maps were received and filed.

WATER INFORMATION SYSTEM

- Access to the U.S. Soil Conservation Service computer in Bozeman, Mt was established. This system is used to obtain Surface Water Supply Index (SWSI) values for the Drought Monitoring project. The SWSI values can be obtained as soon as they are calculated through this access process.
- Access to the Montana Climate Center (MCC) Drought information was also established. This new source provides Palmer Drought information for about 150 stations across Montana. The data are not available from any other source.
- Environment Canada, a EarthInfo. compact disk product was purchased to provide access to Canadian streamflow data.
- Access to the Montana Bureau of Mines and Geology (MBMG) Ground Water Information Center (GWIC) was greatly improved so as to provide access to ground water quality data and other data.

GEOGRAPHIC INFORMATION SYSTEM

STATEWIDE DATA LAYERS

- Montana Department of Fish, Wildlife, and Parks administrative region boundaries.
- Montana Department of Fish, Wildlife, and Parks black bear distribution.
- Montana Department of Fish, Wildlife, and Parks proposed black bear management units.
- Census data blocks and population data for the entire state.
- Census street network TIGER files for the entire state.
- STORET water quality stations.
- U.S. Environmental Protection Agency ecologic regions.
- Montana Department of Agriculture prohibited areas for Strychnine applications.
- Locations of climate stations for which Palmer drought index values are calculated.
- Areas for which Surface Water Supply Index (SWSI) values are calculated.
- WATSTORE - ground water site inventory stations, surface water flow stations.
- SNOTEL stations including a variety of climate stations.
- NOAA climate stations.
- Advanced Very High Resolution Radiometer landcover classification and digital elevation model data for Montana (1000 meter resolution).

REGIONAL DATA LAYERS

- U.S. Geological Survey (USGS) 1:24,000 scale Digital Line Graph (DLG) data were imported for the Upper Clark Fork River Basin. These data files include roads/trails, railroads, utilities, contour lines, hydrography, public land survey system, and administrative boundaries. The GIS also loaded the USGS 7 ½' Digital Elevation Model (DEM) topographic data for the same area.
- Arsenic data from Montana Department of Health and Environmental Services for the Upper Clark Fork Basin.
- The Butte Priority Soils Operable Unit boundary was updated.
- A new coverage of geographic names for the Butte area was created for use with scales near 1:10,000.

- The 1986 Butte land ownership coverage was updated with data provided by CDM.
- The Rocker Operable Unit boundary was digitized.
- Imported Public Land Survey corners in the Upper Clark Fork River Basin.
- Ownership of surface mining claims, Butte.
- Well locations along Silver Bow Creek, with depth to bedrock and groundwater, Butte.
- 1:2400 scale photogrammetric data for the city of Anaconda, a 2000 foot corridor along the entire upper Clark Fork, and the southwestern and extreme eastern parts of the city of Butte.
- 1:4800 scale photogrammetric data for the Deer Lodge valley from Warm Springs to Gregson.
- Revised 1:2400 scale photogrammetric data for Butte, Smelter Hill, and Milltown Reservoir.
- Landsat Thematic Mapper classified image and vegetative stress index classification, upper Clark Fork area (30 meter resolution).
- 53 color images of aerial photographs of Butte, 1 meter resolution.
- Sub-watershed tile structure for Blackfoot River Study Area.
- 1989 Canyon Creek fire boundary for Blackfoot River Study Area.
- Helena National Forest wilderness soils for Blackfoot River Study Area.
- Helena National Forest soils for Blackfoot River Study Area.
- Lolo National Forest landtypes for Blackfoot River Study Area.
- Length of slope or topographic factor for Blackfoot River Study Area.
- Missoula County soils for Blackfoot River Study Area.
- Riparian areas and macrophyte areas from 1987-88 aerial photos for Blackfoot River Study Area.
- 1:24,000 digital elevation models (DEMs) for Libby area.
- Powerline route alternatives from Libby Dam to Troy.
- Clearcut areas for Flagstaff Mountain.

